

Wetland Development And Management In SADC Countries



Proceedings of a sub-regional workshop
19-23 November 2001
Harare, Zimbabwe

WETLAND DEVELOPMENT AND MANAGEMENT IN SADC COUNTRIES

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The workshop would not have been a reality, and let alone a success, without the presence and enthusiastic participation of all the participants who were invited and managed to attend. Discussions were lively and very informative, a reflection of the commitment by all stakeholders in this workshop that deserves commendation.

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List of Acronyms

ADB	African Development Bank
ADD	Agricultural Development Division (Malawi)
ADF	African Development Fund
ARC	Agricultural Research Council
CBD	Convention on Biological Diversity
CBNRM	Community Based Natural Resources Management
CBO	Community Based Organization
CEC	Commission of the European Communities
CEH-IH	Centre for Ecology & Hydrology – Institute of Hydrology (United Kingdom)
CEMP	Community Environmental Management Programme (Zambia)
CDC	Curriculum Development Centre (Zambia)
CIDA	Canadian International Development Agency
CONSAS	Constellation of Southern African States
CURE	Coordination Unit for the Rehabilitation of the Environment (Malawi)
DANIDA	Danish International Development Agency
DEAT	Department of Environmental Affairs and Tourism (South Africa)
DNR	Department of Natural Resources (Zimbabwe)
DoF	Department of Fisheries (Zambia)
DoI	Department of Irrigation (Malawi)
DR&SS	Department of Research and Specialist Services (Zimbabwe)
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry (South Africa)
EDF	European Development Fund
ECEP	Environmental Capacity Enhancement Programme (Lesotho)
ECZ	Environmental Council of Zambia
EECU	Environmental Education and Communications Unit (Zambia)
EEPA	Environmental Education and Public Awareness (Zambia)
EIA	Environmental Impact Assessment
EIS	Environment Information System
ELMS	Environment and Land Management Sector (of SADC)
ESP	Environmental Support Programme
EU	European Union
FANR	Food, Agriculture and Natural Resources Development Unit (of SADC)
FAO	Food and Agriculture Organization of the United Nations
FAO-SAFR	FAO Sub-regional Office for East and Southern Africa

FD	Forestry Department (Zambia)
FDC	Food Deficit Country
FSTAU	Food Security Technical and Administrative Unit (of SADC)
GA	Grazing Association
GDP	Gross Domestic Product
GIS	Geographic Information System
GPZ	Cabinet for the Zambezi Valley
GTZ	Gesellschaft für Technische Zusammenarbeit (Germany)
GWP	Global Water Partnership
ICMP	Integrated Catchment Management Programme
IEM	Integrated Environmental Management
IFAD	International Fund for Agricultural Development
IMERSCA	India Musokotwane Environment Resource Centre
IRA	Institute for Resource Assessment (Tanzania)
IUCN	International Union for the Conservation of Nature
IUCN-ROSA	IUCN - Regional Office for Southern Africa
IWMI	International Water Management Institute
JICA	Japanese International Cooperation Agency
KATC	Kilimanjaro Agricultural Training Centre (Tanzania)
LHDA	Lesotho Highlands Development Authority
LHWP	Lesotho Highlands Water Project
LIFDC	Low-Income Food-Deficit Country
L&WMRP	Land & Water Management Research Programme (of SADC)
MAFF	Ministry of Agriculture, Food and Fisheries (Zambia)
MAFS	Ministry of Agriculture and Food Security (Tanzania)
MANR	Ministry of Agriculture and Natural Resources (Malawi)
MATI	Ministry of Agriculture Training Institute (Tanzania)
MENR	Ministry of Environment and Natural Resources
MEWD	Ministry of Energy and Water Development (Zambia)
MIPA	Malawi Investments Promotion Agency
MNRE	Ministry of Natural Resources and Energy (Swaziland)
MOAC	Ministry of Agriculture and Cooperatives (Swaziland)
MoWID	Ministry of Water and Irrigation Development (Malawi)
NCE	National Council for the Environment (Malawi)
NDA	National Department of Agriculture (South Africa)
NEAP	National Environmental Action Plan
NEMC	National Environment Management Council (Tanzania)
NGO	Non-Governmental Organization
NIDP	National Irrigation Development Plan (Tanzania)
NIPDS	National Irrigation Policy and Development Strategy (Lesotho)

NLP	National Land Policy
NORAD	Royal Norwegian Ministry of Development Cooperation
NRDC	Natural Resources Development College (Zambia)
NRI (UK)	Natural Resources Institute (United Kingdom)
NWC	National Wetland Committee
NWSC	National Wetland Steering Committee
PIDP	Participatory Irrigation Development Programme
RAMSAR	Ramsar Convention on Wetlands, 1971
RMA	Range Management Area
RMD	Range Management Division
SACCAR	Southern African Consultative Conference on Agricultural Research
SADC	Southern African Development Community
SADCC	Southern African Development and Coordinating Conference
SARDC	Southern Africa Research and Documentation Centre
SDB	Soil Data Base
SEA	Strategic Environmental Assessment
SEPS	Socio-Economic and Production System (Malawi)
SETES	SADC ELMS EIS Training and Education Sub-programme
SETU	SADC EIS Technical Unit
SFDF	Swaziland Farmers Development Foundation
SFPDP	Smallholder Flood Plain Development Programme
SMUWC	Sustainable Management of Usangu Wetland and its Catchments
SPFS	Special Programme for Food Security
TOR	Terms of Reference
UNCED	United Nations Conference on the Environment and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
UNESCO	United Nations Education and Scientific Organization
UNIMA	University of Malawi
UNISWA	University of Swaziland
UNITAR	United Nations Institute for Training and Research
UNZA	University of Zambia
USAID	United States Agency for International Development
WCC	Water Control-Component (of the SPFS)
WECSZ	Wildlife Environmental Conservation Society of Zambia
WEDEM	Wetland Development and Management
WET	Wetland Evaluation Technique
WFP	World Food Programme
WHO	World Health Organization
WRM	Water Resources Management

WSCU	Water Sector Coordination Unit (of SADC)
WWF	World Wide Fund for Nature
ZAWA	Zambia Wildlife Authority
ZBWCRUP	Zambezi Basin Wetlands Conservation and Resource Utilization Project
ZWP	Zambia Wetlands Policy
ZWSAP	Zambia Wetland Strategy and Action Plan

PART I

Background information, conclusions and recommendations of the workshop

Background to and objective of the workshop, attendance and arrangements

I.1. Background

One of the guiding mandates within the FAO Constitution is the following: “The Organization shall promote and, where appropriate, shall recommend national and international action with respect to: ... the conservation of natural resources and the adoption of improved methods of agricultural production ...”. In many African countries, in addition to low yields, food production is limited by the availability of land and water resources. At an early stage, FAO has recognized the vast and varied potential contribution of a rational and sustainable exploitation of small wetlands and inland valleys to improve food security. Through several regional workshops organized in different countries over the last 15 years (Sierra Leone, Ghana, Gambia, Benin and Zimbabwe) FAO has built up a network on Wetland Development and Management. During the same period, development projects for increased agricultural production from wetlands and inland valleys were implemented by the Organization in a number of countries such as: Burundi, Benin, Guinea, Guinea Bissau, Kenya, Madagascar, Malawi, Rwanda, Sierra Leone and Zambia, to name only a few. FAO has articulated some of its intended actions and objectives in respect to wetland research, management and utilization within the SADC region in a concept paper that is presented in chapter 2.

It is recognized that wetlands are and remain fragile ecosystems that should be subject to “wise use”, being defined as “sustainable utilization for the benefit of mankind in a way compatible with the maintenance of natural properties of the ecosystem”. Sustainable utilization being “the human use of wetlands so that it may yield the greatest continuous benefit to the present generations while maintaining its potential to meet the needs and aspirations of future generations” (RAMSAR Convention on Wetlands, 1971). In particular, wetlands provide important natural and socio-economic functions that should be fully taken into account when envisaging any intervention in such areas.

The central thrust in this SADC regional initiative by FAO is to undertake action for the conservation of natural resources and the adoption of improved methods of agricultural production. This stems from the recognition that wetlands have potential in bridging the gap in food production and supplies that are currently lagging behind demand in the region.

The FAO regional consultation on “Wetland characterization and classification for sustainable agricultural development”, held in December 1997 in Harare, concluded and recommended the following:

1. The plenary session recognized the important potential and contribution of wetlands towards food security and poverty alleviation, especially in years of drought. While scattered work exists in this respect, compilation of all information available was recommended.
2. No clear definition corresponding to the different types of wetlands important to food security could be provided.

3. There was no common understanding on the focus of the consultation as to whether it would concern small wetlands or other types used for agriculture production. There was, however, consensus on the importance of the use of wetlands by smallholders.
4. The consultation recommended the following:
 - The initiation of a regional network on the utilization of wetlands for food security without undue impact to the environment. Linkages to existing networking and wetland programmes should be sought
 - A holistic approach towards the characterization and classification of wetlands based on existing and future data on all biophysical and socio-economic parameters
 - At national level, development of wetlands should be based on sound plans of action incorporating:
 - participatory approaches
 - research and development
 - national capacity-building
 - dissemination of information
 - monitoring and evaluation
 - development of enabling environment through appropriate policies, strategies and legislation, enhancing sustainable and environmentally sound utilization
5. FAO was requested to organize a meeting within the next twelve months to implement a networking arrangement. Countries agreed to prepare a “state of the art” report on policy, institutional and technical issues related to wetland development. The Representative of the Government of Zimbabwe was requested to coordinate with countries in close collaboration with FAO’s Sub-regional Representation to prepare a format for this report. A draft project document is to be discussed in the next meeting and submitted to Donors with FAO’s assistance.

The proceedings of that consultation are available at the following websites:

<http://www.fao.org/ag/agl/oldocs.asp> or <http://www.fao.org/docrep/003/x6611e/x6611e00.htm>

In April 2001, a workshop on “Sustainable utilization of wetlands/dambos in Southern Africa: a sustainable management approach for wetlands/dambos” was held in Zimbabwe, sponsored by IWMI and facilitated by ARC-Zimbabwe. FAO, IUCN, IWMI and SADC are also working together on the preparation of a SADC umbrella action programme proposal on “Sustainable wetland development and management in Southern Africa for poverty alleviation”.

In preparation of the present workshop, FAO engaged eight national consultants to gather and consolidate information on wetlands within 8 of the 14 SADC countries. Standardized and structured Terms of Reference (TORs), which emphasized on agricultural utilization of wetlands, guided the national consultants in their individual efforts (chapter 5.1). The national information was further analyzed and consolidated by a regional consultant into five papers that covered the following thematic issues:

- ❖ Wetland policies and strategies
- ❖ Wetland characterization, classification and inventories
- ❖ Projects and activities, exchange and dissemination of information on wetland use
- ❖ Training and education on wetland use for agricultural purposes
- ❖ The importance of wetlands for agriculture in the SADC countries

1.2. Objective of the Workshop

Key stakeholders of each country including the national consultants were invited to the workshop at which the synthesized information on wetlands in the participating countries was to be presented and discussed. The objective of the workshop was to contribute to the development of a regional (SADC) action programme and a possible regional technical assistance programme, based on the findings, conclusions and recommendations of the consultancies and discussion sessions anchored on the five thematic issues of interest as indicated in chapter 1.1.

At the beginning of the workshop participants were asked to indicate some of their key expectations of the workshop and these are summarized below as being:

- ❖ Create a solid foundation for ensuring sustainable food security in resource-poor farming communities through wetlands utilization
- ❖ Determine the influences or the impact of wetlands in increasing productivity
- ❖ Develop the criteria for characterization and classification of wetlands
- ❖ Learn about hydrology and irrigation engineering in the wetlands
- ❖ Encourage gender mainstreaming in all research work on the wetlands
- ❖ Determine the potential intensification of the use of wetlands
- ❖ Learn about wetland management and incorporate it in the existing programmes
- ❖ Understand the ecology and systems that can be applied on wetlands
- ❖ Understand the integrated water utilization in the wetlands

1.3. Attendance and arrangements

Twenty-eight participants attended the workshop held at Holiday Inn in Harare, Zimbabwe, from 19 to 23 November 2001. They were drawn from eight SADC countries and from different organizations including FAO, IWMI, IUCN and CEH-IH (UK). The agenda and list of the participants are given in Annex 1 and 4 respectively.

Technical presentations were given on the first day and are summarized in Part III of these proceedings. The next two days were devoted to specific workshop sessions on the thematic issues. Five key papers, based on information in the national papers and following the thematic issues, were prepared by the regional consultant who presented them as background before each workshop session. These key papers are presented in Part II.

On the third day of the workshop all participants had the opportunity to visit two sites where wetland (dambo) development and management for agricultural purposes is taking place: the wetland cultivation project at Seke and SPFS irrigation projects using treadle pumps in Domboshawa. The visited projects created practical focal points for lively discussions and the participants expressed their appreciation for having had the occasion to visit them.

The workshop was concluded on the fourth day with the review of SADC wetland action programmes and technical assistance projects, followed by the conclusions and the adoption of the recommendations of the workshop. FAO-SAFR, assisted by the Agricultural Research Council through the facilitator, attended to the housekeeping logistics of the workshop.

FAO Concept Paper

Management of small wetlands in Sub-Saharan Africa: A production and protection programme

2.1. Introduction and background

The FAO Constitution describes the mandates of the Organization. One of these mandates is the following: “The Organization shall promote, and where appropriate, shall recommend national and international action with respect to: the conservation of natural resources and the adoption of improved methods of agricultural production ...”. In many African countries, in addition to low yields, food production is limited by the availability of land and water resources. At an early stage, FAO has recognized the vast and varied potential contribution of a rational and sustainable exploitation of small wetlands and inland valleys to improve food security. Through several regional workshops organized in different countries over the last 15 years (Sierra Leone, Ghana, Gambia, Benin and Zimbabwe) FAO has built up a network on Wetland Development and Management. During the same period, development projects for increased agricultural production from wetlands and inland valleys were implemented by the Organization in a number of countries such as: Burundi, Benin, Guinea, Guinea Bissau, Kenya, Madagascar, Rwanda, Sierra Leone and Zambia, to name only a few.

2.2. Agricultural potential of wetlands in Africa

In very general terms, “wetlands are areas where water is the primary factor controlling the environment and the associated plant and animal life. They occur where the water table is at or near the surface of the land, or where the land is covered by shallow water” (RAMSAR information paper). Wetlands are found in a wide range of ecological conditions varying from coastal lagoons, mangroves and large flood plains to small depressions, river valleys and high altitude inland swamps. According to the objectives of the different organizations interested in wetlands, the range of such lands they are looking at varies considerably. Conservation organizations are interested in a large range of wetlands, which also include water bodies, coastal areas, etc. When aiming at small-scale sustainable agricultural development, the range of wetlands that can be considered is much smaller. Also, the types of wetland conservationists and developers are looking at are often different.

For the purpose of the FAO programme on Wetland Development and Management (WEDEM), aiming specifically at the improved agricultural use, wetlands have been defined as “areas that have free water at or on the surface for at least the major part of the growing season. The water is sufficiently shallow to allow the growth of a wetland crop or of natural vegetation rooted in the soil”. (Brinkman, R. and Blokhuis, W.A., 1986). In this definition, the “growing season” corresponds globally to the rainy season during which most agricultural activities take place. In most African countries, crops can also grow outside this season if the water requirements of the crop can be satisfied. While

recognizing the important agricultural potential of large flood plains, mangrove areas, etc., the FAO WEDEM programme is concentrating its activities on small inland wetlands requiring relatively low investments for reclamation and/or improved agricultural use. Compared to large flood plains, mangroves, etc., they are relatively small in size. Such types of wetlands are known under different names in Africa such as: dambo, swamp, machongo, fadama, vlei, bas-fond, etc. Their surface water hydrology varies considerably from one country to another and depends strongly on the prevailing climatic conditions. Many scientific publications provide extensive descriptions of the flora and fauna of wetlands, the soil, the climatic conditions and the landscape. Little work has been done on systematic characterization and classification or the areas covered by different categories of wetland.

The Inland Valley Consortium (IVC), with financial support from France and from the Netherlands and covering ten countries in West Africa, has established during its first phase from 1994-1999 an agro-ecological characterization of wetlands to generate baseline data for technology and systems development. During the presently ongoing second phase these characterization studies will be completed and a regional syntheses of the wetlands in the IVC area will be made. Some other countries, such as Burkina Faso, have made significant progress with the inventory and characterization of wetlands. With assistance from FAO/UNDP a detailed inventory of swampland has been made in Rwanda (1992) as well as a global inventory of swamps in Burundi (2000). Uganda has recently started an inventory of wetlands with assistance from IUCN and funding from the Netherlands.

For most other countries, the global figures of national wetland areas that can be found in the literature are without a clear definition of what lands are considered as wetlands and, moreover, no details of the different categories are given. This makes it extremely difficult to evaluate the global potential of wetlands for different uses. The physical potential of inland valleys and wetlands in Sub-Saharan Africa can be conservatively estimated at 135 million hectares. Only 1.3 percent of this potential is actually cultivated (FAO, 1998). Table 1 provides some statistics on population, agricultural land and wetlands. Countries have been selected based on the availability of information on national wetland areas.

Table 1
Illustration of land areas, population and wetland areas in some selected African countries

Country	Total Land Area* (1000Ha) 1995	Population estimation Total* (1000) 1998	Global Population Density (hab/km ²)	Agricultural land Area* (1000 Ha) 1995	Pop. density agricultural land area (hab/km ²)	Wetlands** (1000 Ha)
Benin	11 062	5 781	51	2 400	240	160
Burundi	2 568	6 457	251	2 200	293	200
Gambia	1 000	1 229	123	395	311	70
Ghana	22 754	19 162	84	13 625	140	2 896
Kenya	56 914	29 008	51	25 820	112	1 440
Malawi	9 408	10 346	110	3 850	269	259
Mali	122 019	10 694	9	34 650	31	700
Rwanda	2 467	6 604	267	1 615	409	165
Sierra Leone	7 162	4 568	64	2 740	167	690
Tanzania	88 359	32 102	36	39 648	81	5 439
Uganda	19 965	20 554	103	8 610	239	2 880
Zambia	74 339	8 781	12	35 279	25	1 505
Zimbabwe	38 685	11 377	29	20 550	55	1 280

* Source: FAOSTAT and AQUASTAT (Agricultural land area includes arable land, permanent crops and permanent pastures. Wetlands may be partly included in the agricultural land area)

** Most publications do not specify nature and characteristics of the national wetland area.

The table shows significant differences in demographic pressure on agricultural land. Countries such as Rwanda, Gambia and Burundi have a very high population density on agricultural land while much more agricultural land per habitant is available in countries such as Zambia, Mali, Zimbabwe and Tanzania.

No details are available on the real nature of the wetland areas that are given in the table (flood plain, valley bottom, swamp land) but it shows nevertheless that significant wetland areas are available in most countries. While no specific detailed information is available with regard to the present use of wetlands for agriculture, it is known that in countries such as Burundi, Rwanda, Sierra Leone and Gambia, to name only a few, wetlands are already extensively used for agricultural purposes and that there is heavy pressure to intensify wetland agriculture in these countries.

2.3. Aspects to consider when intervening in wetlands for agricultural development

Most wetlands have good potential for expansion and/or intensification of agriculture. The major advantages of wetlands are the availability of water and the relative fertility of the soil. In the many regions of the world, wetlands in delta areas have developed into highly productive agricultural zones (deltas and flood plains of the Rhine, Nile, Ganges, Mekong, etc.) This is in spite of the risks of flooding as is experienced yearly in countries as Bangladesh. An equilibrium exists between advantages of wetland agriculture and the inherent risks.

It should however be recognized that excessive development of these wetlands has, at the same time, resulted in extensive disruptions of the hydrological system and destruction of the ecology, the results of which are now being slowly recognized and understood. Wetlands being part of the hydrological system of a catchment area, any change in the water balance conditions at any point will have impacts both upstream and downstream that should be fully evaluated in advance in order to mitigate negative developments. Wetlands are and remain fragile ecosystems that should be subject to “wise use,” this being defined as “sustainable utilization for the benefit of mankind in a way compatible with the maintenance of natural properties of the ecosystem”. Sustainable utilization being “the human use of wetlands so that it may yield the greatest continuous benefit to the present generations while maintaining its potential to meet the needs and aspirations of future generations” (RAMSAR Convention on Wetlands, 1971). In particular, wetlands provide important natural and socio-economic functions that should be fully taken into account when envisaging any intervention in such areas:

Natural functions of wetlands:

- ❖ **Sponge function:** absorbing temporary large quantities of water to release slowly. As a consequence groundwater tables around the area are recharged and natural springs will continue to flow over longer periods and provide water for humans, livestock and wildlife. River stretches downstream are protected against peak flows and are less subject to erosion. The discharge downstream is more steady and there is less need for storage of water for urban and/or agricultural use. Some researchers, however, suggest that the sponge function has not been sufficiently proven and more research is needed in this respect (FAO, 1997).
- ❖ As a result of the significant lower water flow velocities in wetlands, eroded materials will deposit during the stay of the water in the wetland area, resulting in improved soil quality and fertility in the swamps itself, while less deposits downstream prevents siltation of rivers and reservoirs.
- ❖ Because of the high water table and their relatively inaccessibility, wetland areas provide the habitat for a variety of plants and animals (including migratory birds) that depend on the wetland for their survival.

Socio-economic functions of wetlands:

- ❖ Production of vegetal materials traditionally used for different purposes such as handicraft and building materials
- ❖ Gathering of plants and fruits, fishing and hunting
- ❖ Cattle grazing, in particular in dry season
- ❖ Filtration of nutrients and other chemicals from river water
- ❖ Peat extraction for fuel or clay for brick making
- ❖ Tourism

2.4. Guiding principals for interventions in wetlands

Interventions in wetlands, in order to make them suitable for agricultural use or to change existing agricultural practices, should consider a large number of aspects in order to guarantee success. Some of them are specifically related to the particular natural conditions of wetland (water, soil, climate) but the most important aspects are of socio-economic nature. Traditions and other human aspects are important. A number of these aspects are described below:

- ❖ Need to maintain present natural and socio-economic functions, or at least to take these fully into account when taking decisions that may affect any of these, noting that certain interventions may lead to un-repairable destruction of several or all functions of the wetland
- ❖ Changing and unpredictable water levels present problems for rational agricultural use of wetlands. Protection against floods may not be sufficient in extreme and rare events. Prolonged drought may lead to exhaustion of water resources. The risks of such extreme events should be assessed and accepted by the farmers
- ❖ Changes of groundwater levels (in particular in peat swamps) will have significant repercussions on the levels and structure of the soil. Some wetlands may have or could develop salinity problems or soil nutrient deficiencies that should be taken into account
- ❖ Depending on the level of interventions (water control structures), investment and maintenance costs can be relatively high and may not be justified by the increase of production, in particular when a potential for increase of rainfed agricultural production still exists in the area
- ❖ Government policies regarding land tenure and national legislation may not be in favour of private investments in wetland areas. Some wetlands are transboundary or have transboundary implications. International contacts and possible trade-off of certain interests between governments are long-lasting processes
- ❖ Human resources may not be available at all, or not at the level needed, at the time when required for agricultural activities. Wetland activities, and in particular the clearing of land, are very labour intensive and may be conflicting with other productive or non-productive occupations. Gender issues should receive appropriate attention. Population density on agricultural land in a country or region can provide useful indications on the need to develop wetland agriculture
- ❖ Water control infrastructures need to be managed and maintained by farmer groups. In many cases farmers' organizations are not sustainable
- ❖ Increased production from wetlands, in particular perishable crops produced during the counter season, may experience marketing problems. Difficult access and rough roads may increase such problems
- ❖ Large variety of wetlands exclude standard projects, each intervention needs to be developed on an ad hoc basis. In general, there is lack of scientific knowledge of all aspects of wetlands. Most

countries do not have appropriately trained staff at all levels and they lack a general infrastructure to assist farmer communities with wetland development issues

- ❖ Many agricultural problems related to the specific nature of wetlands can occur, such as lack of adapted crops and/or varieties, weed control problems, crop diseases related to the natural conditions of the wetlands, protection of crops during the counter season against insects and birds, etc.
- ❖ Traditional grazing of livestock on wetlands in the dry season will conflict with intensive all season agricultural use
- ❖ Working in wetlands may present health risks such as Malaria, Bilharzia, Human African Trypanosomiasis and riverblindness

Summarizing, three pillars are needed to support wise and sustainable agricultural use of wetlands: bottom-up approach, creating an enabling environment and scientific/technical knowledge and support.

- ❖ Bottom-up approach: the initiative or request to expand agricultural activities in wetland should come from the group of population that is directly concerned. Particular attention should be given to gender issues
- ❖ Enabling environment to be created by the Government and other authorities. Clear decisions on what is protected and what is not, and on what areas can be considered for development with the lowest risk of environmental degradation. Land tenure and other legal aspects of the use of wetlands are satisfactorily solved and the laws are enforced. The availability of small-scale credit will greatly contribute to agricultural development
- ❖ The availability of scientific and technical knowledge of wetland and wetland agriculture and technicians with specific training in wetland development to assist with project development and implementation and also to avoid any destructive interventions as result of ignorance

2.5. FAO programme for sustainable wetland development and management in sub-Saharan Africa

Future activities that are undertaken by FAO through its normative programme and in the framework of its field programme are now guided by the Strategic Framework for FAO 2000 – 2015 and should, at the same time, be part of one of the special programmes of the Organization, the most important one being the Special Programme for Food Security (SPFS).

2.5.1. The strategic framework for FAO 2000 – 2015

The Strategic Framework for FAO 2000 - 20015 was approved by the FAO Conference at its session of November 1999. It provides the authoritative framework for the Organization's future programmes and has been formulated through extensive consultations with FAO's stakeholders. It defines a set of strategies that are based on the principles of interdisciplinarity and partnership.

The FAO programme for sustainable wetland development and management is part of main strategy component D that is aimed at supporting the conservation, improvement and sustainable use of natural resources for food and agriculture (FAO, 1999). Under this component it is mentioned that "The well being of present and future generations is threatened, particularly in developing countries, by land degradation, water scarcity, and pollution and salinization, destruction of forests, overexploitation of the world's marine resources, growth in emission of greenhouse gases and loss of genetic resources. Fragile ecosystems in particular are on the front line of danger. The challenge is to strike an appropriate balance between conservation and sustainable use of natural resources. This implies adopting policies and actions that contribute to efficient and socially desirable management of land, water, fisheries and

forest resources, and which, considering the multifunctional character of agriculture, enhance its positive and mitigate its negative impacts on the environment and natural resources”.

With regard to the sub-strategy component of integrated management of land, water, fisheries, forest and genetic resources (D.1), the development and promotion of integrated resource management systems in such areas as watershed and coastal zone management, transboundary resources, management of aquatic and forest resources and genetic resources for food and agriculture, are emphasized. In the field of conservation, rehabilitation and development of environments at the greatest risk (sub-strategy component D.2), the Organization will contribute to:

- ❖ Monitoring and assessing the state of fragile ecosystems, developing criteria and indicators for their sustainable management and building capacity for environmental impact assessment and risk analysis
- ❖ Enhancing institutional and planning capacity at the local, national, regional and international levels ...
- ❖ Promoting the sustainable development, conservation and rehabilitation of fragile ecosystems and areas ...

2.5.2. Special Programme for Food Security

Proposed by the FAO Director-General and unanimously approved by the FAO Council in June 1996, the main objective of the FAO Special Programme for Food Security (SPFS) is to help Low-Income-Food-Deficient-Countries (LIFDCs) improve their food security through increased food production and productivity, as well as through stability in the year-to-year production, on an economically and environmentally sustainable basis. Its goals are to maximize national food self-reliance, increase employment and income-creating opportunities, and reduce the risk of disruptive variations in food supply. The Programme uses on-farm and small-scale demonstrations as an entry point for identifying the actions necessary to remove production constraints and follows a participatory and integrated approach in order to enhance sustainability and equity. The programme is at present active in 60 countries, of which 36 are Africa. In addition to FAO's own resources to the level of US\$5 million/year, the programme receives support from bilateral and multilateral donors, financial and international institutions.

Water control is essential to increase food security and to reduce the variability of food production in most Food Deficit Countries (FDCs). The introduction of small-scale water harvesting, irrigation and drainage systems using rainfall, water runoff, small streams, shallow groundwater and simple lifting devices, such as the treadle pump, for increased crop production is the most important component of SPFS projects. Many of the SPFS projects in Sub-Saharan Africa are located in wetlands and valley bottoms.

2.6. Objectives and strategy of the FAO wetland programme

Following the recommendations of the participating countries, expressed in several regional workshops in Western Africa, FAO decided to establish in 1990 a Technical Cooperating Network for Wetland Development and Management (WEDEM). The initial goals of the network were the exchange of knowledge and experience, the promotion of research to enhance scientific and technical knowledge, the promotion of characterization and classification of wetlands and capacity-building. The present orientation of the activities of WEDEM in Sub-Saharan Africa is based on the three pillars mentioned above: bottom-up approach, enabling environment and technical support. The activities that FAO proposes to undertake cover the following five fields:

- ❖ Assist governments with the formulation of national policies and strategies with regard to the management of wetlands as part of an hydrological catchment on the one hand, and as part of a farmer's production system on the other hand, legal issues on water use and land ownership, etc.
- ❖ Collect all available knowledge on the characterization of agro-ecosystems of wetlands or alternatively identify and describe the sources where such information is available. Establish a database with scientific and technical information on field experiences in the development of wetland for agricultural purposes from all possible sources: local knowledge from farmers, results of projects, agricultural research, etc.
- ❖ Establish a website and a regional network to make all collected information easily accessible to all potential users and to obtain feedback in order to maintain and update the database with new knowledge and recent experience
- ❖ Prepare guidelines for field technicians on the participatory approach towards development and management of wetlands for agricultural purposes. The needs, priorities and capacities of farmers and farmer communities will be the starting point to any wetland development activity. The first activity to be undertaken is an Environmental Impact Assessment (EIA) to assess the environmental risk of an eventual development. Since all wetlands are different, and the needs and capabilities of farmer communities are varying, no standard solutions can be applied. Each project needs to be developed and planned separately and in a participatory way
- ❖ Assess training needs at all levels and arrange for training through improvement of existing training institutions (schools, universities, regional institutions), through regional and national training courses, self-training materials and distant learning facilities

These activities will be fully integrated and coordinated with those undertaken by national governments from regional organizations and institutions. While some of them will be undertaken with the limited resources that can be made available from the FAO budget, most of them will need financial support from extra-budgetary resources.

The identification and formulation of national projects will be undertaken following specific requests from the national governments and in close collaboration with all the relevant national authorities. The formulation of regional projects will generally be done after initial contacts with an existing regional organization that has wetland development in its mandate and is interested in becoming the counterpart of such a regional project and may later continue certain activities, such as assuring the continuation of a network and updating of database.

2.7. References

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- FAO. 1999. The Strategic Framework for FAO 2000 – 2015
- RAMSAR Convention on Wetlands, 1971

Summary of discussions

The programme of the workshop contained four sessions on specific thematic subjects and one session on the importance of wetlands for the SADC region. Based on information in the national papers and following the thematic issues, five key papers were prepared by the regional consultant and presented as background before each workshop session. Each of these presentations was followed by discussions in three small working groups and plenary discussions. Some highlights of the discussions on the five thematic issues are summarized below.

3.1. Session I: Wetland policies and strategies

3.1.1. Targeting institutions/organizations

Some participants wondered if efforts to put ‘teeth’ into policies and strategies may be being applied at the wrong end. Instead of concentrating efforts on the lead government institutions responsible for policy formulation and ‘enforcement’, it would possibly be more effective to build capacity of Community Based Organizations (CBOs), so that they are able to understand the Policies and Acts, and have the mechanisms to enforce them at grassroots level. Interpreting the Acts into simple language easily understandable by CBOs and local leadership could facilitate this.

3.1.2. Formal research and indigenous knowledge

There seems to be a contradiction in the call for more research on one hand, while on the other hand it is maintained that there exists a wealth of indigenous knowledge about the wetlands. It was concluded that there is no contradiction. There is indeed a need for more scientific research on wetlands. However, there is also need to better understand indigenous knowledge so that it can be used to compliment or augment modern scientific knowledge. This requires that indigenous knowledge be properly acknowledged and documented.

Policies need to incorporate both appropriate traditional and modern scientific understanding. In the process of developing policies that incorporate traditional knowledge, there must be stakeholders’ participation through consultations. Policies must be people-focused. The idea that the resources and conservation issues can be handled without consideration of people is not valid.

The workshop generally acknowledged that:

- ❖ Local people often know more about the operations of a system and optimum methods of utilization than outside ‘experts’. It is therefore important to build onto this knowledge in policy formulation
- ❖ Outside experts can offer a wider (catchment) perspective of utilization, and perhaps a better idea of problems that may arise as a consequence of increased pressure on a system resulting from increased population and poverty pressures

3.1.3. Guidelines for policy formulation

On the issue of production of guidelines for policy formulation, it was brought to the attention of the participants that there are already guidelines for the formulation of wetland policies under the Wetland Convention. There is still need, though, to produce regional guidelines for conducting consultations during the formulation process.

It was pointed out that signatory governments respect international protocols, but the concern is how these protocols are implemented at grassroots level and what mechanisms are put into place by each member country to translate the protocols into action.

It was agreed that National Wetland Committees (NWC) have a role as national focal points on wetlands and that they need to be properly institutionalized and recognized by governments. Membership needs to reflect the diverse stakeholders, not only in wetland conservation and protection, but also in utilization and management.

Participants debated whether conflict between wetland conservation and utilization is a real issue at community level. If wetlands are to be conserved, people must value them and this requires that they be seen to provide benefits in some way. The real question is deciding what is the best way to utilize a wetland. Agriculture may bring benefits of increased food production. Conservation may bring social and economic benefits through tourism and recreation. It is also important to remember that, at global level, wetlands bring intrinsic benefits through the ecological and hydrological functions that they perform and these must be considered when planning wetland development and management.

While it is possible to use wetlands for agricultural purposes, agricultural practices must be appropriate and sustainable to the system under consideration. Knowledge of the limits of different ways of utilizing different wetland types ought to be increased. Until this knowledge is available, the precautionary principle should apply.

Essentially, steps that need to be taken in reducing potential conflicts are:

- ❖ Community consultations in matters concerning their environments
- ❖ Community involvement in programme design
- ❖ Implementation of community awareness programmes
- ❖ Community driven research and development
- ❖ Demonstrations of what is possible
- ❖ National surveys to give the global picture

3.1.4. Policy influence on regional institutional arrangements

The SADC region will be developing regional policies in the fields of food, agriculture and natural resources. Protocols in water, environment and wildlife sectors need to be developed through a process of consensus-building between states, which are then ratified by individual states and written into national legislation. The problem is that all nations have their own interests. Consequently, in order to develop consensus and ensure that there are 'no losers', there is need for consultations between countries as they translate international or regional protocols into action. Protocols have a tendency to be formulated in very general terms and may lack effectiveness if not properly translated for actual implementation.

3.1.5. Policy influence on national institutional arrangements

Institutions serve the same purpose in wetlands but the actual arrangements vary between countries. In general, public institutions at country level with a stake in wetland development and management

include: Department of Water, Department of Agriculture/Land, Department of Natural Resources/Land, Department of Environment/Conservation, Department of Tourism, and Department of Wildlife.

Commonly, these national institutions have different priorities and objectives that can cause conflicts. In order to reduce such institutional conflicts, the following approaches can be recommended:

- ❖ Institutions should collaborate and contribute to the harmonization of national wetlands policies
- ❖ The creation of new institutions dealing with wetland issues should be avoided, one should rather build on existing arrangements
- ❖ Institutions should at least acknowledge and understand the requirements of other institutions in relation to wetland utilization

Two key strategic approaches identified by the workshop participants for the harmonization of activities in national programmes are:

1. The establishment of national bodies to address and develop a national wetland policy that brings together all stakeholders, and is consistent with international conventions and protocols that the country has signed up to. The coordinating body may be located within an existing institution/department but must include representatives from other institutions that have an interest in wetland issues. An example of such a body is the Zambia's Wetland Steering Committee, housed within the Department of Environment, but with representatives of most other government departments. Another cited is the Botswana Core Reference Group on Wetlands, which includes representatives of organizations with a direct interest in wetlands, and the Wider Reference Group, which encompasses any other persons or organizations with a more peripheral or less direct interest in wetlands. The extent to which these bodies will be effective depends on the extent to which their mandate is formalized by government.
2. It should be explicit in the mandate of Catchment or River Basin Authorities that they should consider wetland issues in the development of Integrated Catchment Management Plans.

3.1.6. Harmonizing national policies and strategies at regional level

The problems that were identified as causing uncoordinated policies and strategies included the following:

a. Haphazard policy formulation

Identified problems:

- ❖ Stakeholders are not always consulted in policy formulation process
- ❖ Some governments/organizations always hire foreign experts to draft policies and strategies for wetland management and utilization, for example Lesotho
- ❖ Political and cultural drives override the consultative process and thus policy formulation is top-down
- ❖ A code of conduct for utilization and conservation is often lacking due to lack of participatory environmental assessment

Identified potential solutions:

- ❖ Participatory stakeholder consultation in policy formulation process is necessary - not just slogans
- ❖ Policies and strategies can be harmonized through guidelines to be used by different countries in SADC regarding policy formulation on wetlands development
- ❖ Global funding can be secured if priorities for programmes are appropriately identified

- ❖ Policies and strategies should go through both a clearing mechanism and a network created for SADC countries to check each others' policies

b. Inconsistency in wetland classification

Identified problems:

- ❖ Varying classification and definition results in people talking at different levels about the same thing or referring to different terms to mean the same thing

Identified potential solutions:

- ❖ There is need to encourage a derivation of a classification system followed by an inventory of existing classes of wetlands. This will help develop pertinent wetland policies and management strategies
- ❖ There is need to identify attributes to be used as a basis for classification

c. Regional policies are generally not respected

Identified problems:

- ❖ Countries tend to ignore other countries' policies as well as regional protocols just to protect their own interests
- ❖ Some countries simply do not have the capacity to uphold regional protocols and policies

Identified potential solutions:

- ❖ Signed protocols are a sign of and pledge for compliance. Those that deliberately abrogate should be punished. Punitive measures should be developed for those countries that do not observe the law and these could be part of those protocols
- ❖ SADC should take a lead in establishing such protocols. These regional protocols can work particularly well if the Ministry responsible for the implementation of a protocol within a particular country has influence. An example of a protocol that has been successful is the Wildlife Protocol. The protocols must outline the institutional arrangements that support implementation of the protocol. For example, in the case of Shared Water Courses, the setting up of River Basin Authorities was specified in the Protocol. Such institutions may be required to deal with technical issues, day-to-day management and data sharing, and harmonization of approaches between countries. There is a need for a specific SADC wetland protocol that should possibly be coordinated with the protocol on Shared Water Courses

d. Conflicting laws on transboundary resource use

Identified problems:

- ❖ The fact that Zambia observes a fish ban in Lake Kariba during a particular time of the year when Zimbabwe continues to fish in the same waters was given as an example

Identified potential solutions:

- ❖ Catchment Management Committees on both sides should meet and solve the problems for transboundary resource use
- ❖ One country can help another in building capacity where possible

3.2. Session 2: Wetland characterization, classification and inventories

3.2.1. Definitions and terminology

The participants recognized the importance of understanding the terminology used. *Characterization* was agreed to refer to the description of the characteristics (salient features and distinctive traits) of the wetland that are used in classification. *Classification* was then understood to be the grouping of wetlands according to selected common characteristics. Wetland *inventory* was then understood to refer to the determination of occurrence, extent and number in a locality or country of each of the classes of wetlands.

Based on the key paper on wetland inventories and characterization, presented by the regional consultant (chapter 7), the participants deduced that the definition for wetland given in the FAO concept paper (chapter 2) was not adequately encompassing. It was not broad enough to include aquatic crops such as floating rice or fisheries. Also, the participants felt that the proposed methodology presented by IWMI (chapter 14) provided a basis for assessment rather than classification. The work was similar to that carried out by CEH for FAO (Bullock *et al.* 1997), in which GIS systems were utilized. It was found futile to attempt to classify wetlands on current utilization systems, it was found better to simply identify the attributes of each individual wetland. It was also recognized that crop specific requirements might influence classification.

3.2.2. Roles of characterization, classification and inventories

The identified roles of *characterization* included the following:

- ❖ To better understand the attributes of the wetlands in physical (hydrology, soils, shape and wetness), biological (flora and fauna) and chemical terms (pH and nutrients)
- ❖ To gain an understanding of the wetland as a system in its current state and behaviour, and the interrelationships of its various functions
- ❖ To provide a guide on the safe levels of utilization, and on activities that can lead to degradation
- ❖ To provide the basis for classification

The identified roles of wetland *classification* included the following:

- ❖ To provide the required universality of definitions, so as to assist in the harmonization of national and regional policies, strategies and activities on wetlands
- ❖ To assist in the development of guidelines for conservation and management, and for utilization strategies and policies
- ❖ To assist in mapping of wetlands
- ❖ To provide a basis for carrying out inventories

The identified roles of wetland *inventories* included the following:

- ❖ To assist in identifying the extent and numbers of each class of wetland in a country
- ❖ To assist in resource allocation at national and regional level
- ❖ To assist in setting up appropriate monitoring systems
- ❖ To assist in valuation of the natural resources of a country
- ❖ To assist in designing appropriate interventions (e.g. research programmes, development programmes), that are more cost effective

3.2.3. Fragmentation in the characterization and classification systems

The workshop recognized the current fragmentation and inconsistencies that exist in the characterization and classification systems of wetlands in the region. Some of the factors identified as being responsible for this include the following:

- ❖ Characterization and classification are carried out by special interest groups such as conservationists, environmentalists, who only approach the exercise from their point of views
- ❖ The interests of funding agencies have led to partial views of the wetlands (for example, IUCN would look at the wetlands from the point of view of conservation)
- ❖ National interests affect the way in which wetlands are classified

The need for standardization of these processes was highlighted by the workshop. It was recognized that it would be more feasible and easier to standardize characterization, as it includes the whole range of biophysical and chemical attributes. With respect to wetland classification, standardization was considered to be more difficult to achieve, given the fact that 'utilization' is not viewed as an externality to the system, but as a parameter in the classification itself.

3.2.4. The use of utilization and socio-economic aspects as parameters in classification

The issue of including 'utilization' as a parameter in classification was debated at length. It was pointed out that there might be a problem with 'current use' as a parameter, since current use is a function of numerous social and demographic factors. It was argued that even 'potential use' might be a consequence of the classification, rather than a defining parameter of the class. The participants agreed that utilization (for example, type of crops being grown) would serve more as indicators of the biophysical and chemical characteristics of the dambo, the latter two being the parameters to be used in classification.

Further debate crystallized the agreed position that though socio-economic parameters are important in wetland utilization, they should not be used as parameters for classification. It was emphasized that, in order to include local knowledge, it would be appropriate to take into account the different strata of users. In drawing up utilization strategies and management plans, there is need to interface the socio-economic aspects with the physical parameters effectively.

3.3. Session 3: projects and activities; exchange and dissemination of information on wetland use

The workshop recognized the fact that whilst there may be masses of information that have been generated within the region most of it remains unrecognized, and that there is limited sharing of the information between stakeholders. Recommended strategies to improve this situation included the following:

- ❖ Setting up a protocol on regional data exchange
- ❖ Developing websites on the use and conservation of wetlands
- ❖ Data archiving in accessible databases, documents and reports
- ❖ Encouraging and supporting established institutions to hold and maintain databases, for example universities, SADC and FAO
- ❖ Promoting regional workshops on wetlands

3.3.1. Roles of wetland database

Wetland databases were identified as being an asset to the region, and with the following roles:

- ❖ To enable the sharing of information, nationally, regionally and internationally
- ❖ To assist in the identification of research needs
- ❖ To assist in policy and strategy formulation
- ❖ To facilitate the monitoring of threats and risks

The workshop participants agreed on establishing national wetland steering committees. The committees will assist in determining the structure and in the appointment of a permanent secretariat staff. The database secretariat is expected to do some of the following activities:

- ❖ Exploring and identifying existing databases and the information they carry
- ❖ Developing standard formats for the database
- ❖ Data gathering
- ❖ Developing classification systems for ease of reference
- ❖ Regular updating
- ❖ Administering the Documentation Centre

3.3.2. Research applicability, effectiveness and accessibility

The workshop recognized the weaknesses that characterize research and development activities on wetlands in the region, in respect to applicability, effectiveness and accessibility. Following are recommended actions to address some of these shortcomings:

Improve research applicability

- ❖ Use participatory approach addressing relevant needs, priorities and problems
- ❖ Establish linkages with other activities/projects oriented to livelihood strategies
- ❖ Target questions the decision-makers want answered
- ❖ Identify target groups, e.g. local communities, decision-makers (government officials)
- ❖ Guarantee constant feedback and consultation throughout the research process, and continuous evaluation
- ❖ Package results to suit different target groups
- ❖ Use local languages, pictures, posters that are well understood by the local communities

Improve research effectiveness and accessibility

- ❖ Conduct demand-driven research, which would address problems and needs
- ❖ Jointly set priorities for researchers, extension workers and farmers for shared visions
- ❖ Promote collaboration among public and private research and development institutions and farmers to enhance collaboration among service providers
- ❖ Set up clearing-house systems for efficient resource utilization and effective translation of findings to policy makers and development agents
- ❖ Promote ownership by stakeholders and establish national steering committees based on multidisciplinary team arrangements
- ❖ Assume a programme approach and strategic plan recognition of wetlands within a catchment perspective; this fosters involvement by different sectors and users

- ❖ Evaluate and update progress in good time for purposes of responsive planning
- ❖ Provide constant feedback and consultations throughout the research process
- ❖ Facilitate access of international research and findings by national level users
- ❖ Pilot proven technologies with the full participation of extension and target farmers

3.4. Session 4: Training and education on wetland use for agricultural purposes

The workshop acknowledged the lack of training specifically targeted to wetland utilization and development in the region. The majority of training activities identified and cited are designed for the natural resources management in its broader sense.

3.4.1. Strategies for implementing an effective training system

One of the strategies widely proposed and adopted was the involvement of the private sector and universities in supporting training. The South African experience was given as an example, where large companies exploiting wetland resources are being requested, for their corporate responsibilities, to support wetland management. Specific examples mentioned include the Mondi Company in South Africa, which is supporting the Mondi Wetland Rehabilitation Programme, and Unilever in Sri Lanka, which is involved in the spread of information on water resources management through calendars. The latter is also supporting scholarships on water resources management (WRM).

The participants, however, recognized the need for clear and effective strategies to engage the private sector. Two examples of such strategies mentioned include enticing companies to associate themselves with wetland programmes and projects with a proven track record, and the application of international and national pressure for companies to take up their social responsibilities.

3.4.2. National, regional and institutional capacity-building

A proposal to create national and regional wetland management training centers was put forward by the workshop participants. The national training centers would need to have, amongst others, the following activities and capacities:

- ❖ Develop special wetland-related curriculum
- ❖ Develop national monitoring and evaluation systems
- ❖ Promote farmer-to-farmer training in relevant and progressive skills
- ❖ Identify and design modules that can be incorporated into the formal educational systems at various levels
- ❖ Collaborate with other national institutions and contribute to national efforts in reviewing the perceptions/classification of wetlands
- ❖ Facilitate/contribute to the documentation of wetland development and management information
- ❖ Facilitate the dissemination of information
- ❖ Participate in or develop the training of trainers' programmes
- ❖ Promote results of and draw information from wetland research by existing national institutions (incorporating indigenous knowledge)

The proposal for regional training centers was unanimously agreed on, and the roles and activities that such an institution would play were articulated as being the following:

- ❖ Support the establishment and function of national training centers on wetland management and development
- ❖ Develop regional monitoring systems on wetlands
- ❖ Clarify focus of and incorporate wetland management in existing programmes
- ❖ Train regional personnel and staff on specific skills and techniques benefiting national programmes
- ❖ Design network and support transboundary information exchange

International centers with relevant experiences and interest in wetlands were recognized as being in a position to play pivotal roles in the following fields:

- ❖ Provide experience in the collection, analysis and exchange of information
- ❖ Identify and provide financial support
- ❖ Identify needs and sources for cross-national information exchange
- ❖ Provide support to grassroots training programmes

3.4.3. Training needs, training institutions and target groups

The workshop identified existing institutions that are generally found in all the member countries that could be targeted for providing training, and with minimal institutional reorganization and establishment. Such institutions included universities, technical colleges and schools, and primary and high schools in the formal educational sector. Within the informal education sector extension departments and community groups were singled out as being appropriate.

To facilitate their engagement into appropriate training, the following activity pointers were articulated by the workshop:

- ❖ Check needs against existing modules/resources and see what is missing or what is inadequate
- ❖ Develop specific modules to fill the gaps
- ❖ Facilitate the training of trainers in the development of modules
- ❖ Engage in regional collaboration to share experiences
- ❖ The region to develop robust modules that are, however, adaptable at country/local level for use in tailor-made courses

Some of the training needs suggested by the workshop participants for the identified target groups are presented in Table 2 below. These needs are generic and are based on the experiences by the participants. The communities at grassroots level would be the only ones to provide area specific needs.

3.5. Session 5: Importance of wetlands in SADC countries (Action programme and technical assistance)

The key paper presented during this session pulled together the critical issues on wetland management and utilization within the region, in an attempt to summarize the significant roles played by these ecosystems on the livelihoods of SADC communities. The discussion that followed was to put together lessons and recommendations for the way forward, as presented in the next section.

Table 2

Training needs in wetland utilization and management for identified target groups in the SADC region

Target group	Content	Conflict management	By-laws	Management practices	Cause & effect	National laws	International laws	Value of wetlands	Techniques on research	Awareness
Farmers		**	**	**	**	**				**
Extension		**	**	**	**	**				**
Students			**	**	**	**	**		**	
Policy makers					**			**		
Politicians			**			**	**	**		
Civil servants		**			**		**	**		**
Researchers		**	**	**		**	**	**	**	**
NGOs										
Community leaders			**	**	**	**	**	**	**	
Local authorities				**	**		**	**		**
Chiefs/village leaders				**	**	**	**			
Some of the strategies suggested for use in the above training fields (not presented in any sequence)										
• Change curricula				• Sensitize or lobby					• Exhibitions or shows	
• Use case studies				• Use of parliamentarians or committees					• Field days	
• Seminars and workshops				• Print and electronic media					• Meetings	
• Short courses				• Awareness campaign					• Continuous scanning/updates/monitoring by institution or steering committee (strategic plan)	
• Development of course material				• Lobby civil servants						
				• Feedback, sharing farmers' experience						

Conclusions and recommendations of the workshop

The conclusions and recommendations of the sub-regional workshop arrived at were formulated as follows:

4.1. Wetland policies and strategies

- ❖ Need for a National Wetlands Committee in each country was identified and all delegates agreed to see to its establishment in their respective countries. The workshop emphasized that such a national committee has to be multi-sectoral in its representation
- ❖ There is an urgent need to develop National Strategic Plans on wetland development and utilization in each country. This forms the pillar and reference point for related development activities
- ❖ The workshop recognized the need for guidelines on the approach to the development of policies and strategies. The importance of broad consultations and the incorporation of indigenous knowledge in policies were particularly mentioned
- ❖ In recognition of an omission in the past, the workshop emphasized the need to enhance (in order to better reflect multiple uses) that part related to wetlands in existing SADC protocols
- ❖ A call for the development of a mechanism for harmonizing national policies and strategies on wetlands, mainly with regards to shared wetland systems, was registered

4.2. Wetland characterization, classification and inventories

- ❖ There is a need to identify, develop and elaborate common wetland definition(s), characterization and classification systems for SADC countries
- ❖ All countries are encouraged to characterize and classify wetlands based on the agreed standard systems

4.3. Projects and activities; exchange and dissemination of information on wetland use

- ❖ A recommendation to develop communication strategies that identify appropriate channels, information needs and stakeholders was adopted
- ❖ Need to set up a protocol on regional data and information exchange
- ❖ Need for establishment/strengthening of national documentation centres, especially in reference to information on wetlands development and management
- ❖ Need to appropriately package research results and experiences so that they are more accessible to the different stakeholders. Establishment of clearing-houses for research and development was highlighted
- ❖ Encouragement of exchange visits by grassroots communities was emphasized

4.4. Session 4: Training and education on wetland use

- ❖ The workshop recognized the need by national programmes to undertake training and research needs (demand driven) analysis within the framework of the national wetland strategic plan
- ❖ All national programmes need to develop or facilitate the development of curricula that are specific to wetland development and management
- ❖ Incorporate wetland development and management related training and research in programmes of existing and new institutions
- ❖ Encourage and capitalize on regional collaboration arrangements (for example, SADC wetlands projects, Waternet, Biodiversity Program, Global Water Partnership, etc.)

PART II

Key papers presented at the workshop

5.1. Background to the national country papers

Within the overall framework of the FAO Wetland Programme, as described in the concept note on “Management of small wetlands in Sub-Saharan Africa: A production and protection programme” (chapter 2), national consultants from Lesotho, Malawi, Mozambique, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe each prepared a separate structured country study on wetlands.

The terms of reference for the national consultants were as follows:

Within the overall framework of the FAO Wetland Programme as described in the programme document, in close collaboration with the FAO Representation and under the overall supervision of the designated FAO/AGLW technical officer, the national consultant will prepare¹ a global inventory of recent and ongoing activities in wetlands² and collect materials related to their agricultural use. In particular the national consultant will:

- ❖ Report on the existence of national policies and/or national strategies with regard to wetlands and collect copies of such documents. Identify and describe the national government institutions that are responsible for, or in charge of, the different aspects of wetlands conservation, development and management
- ❖ Describe inventories of wetlands that have been undertaken in the country since 1980. Elaborate upon summaries of the results of such inventories and prepare a short description of the characterization or categories used. Where no inventories have been undertaken, a search should be undertaken in specialized literature to obtain information about areas of different categories of wetland in the country. Prepare an exhaustive list of reports, publications, maps and other materials on inventories, characterization with short summaries or descriptions, and indications as to where those documents are located
- ❖ Identify present ongoing projects in the field of wetland development for agricultural purposes undertaken by international or bilateral organizations, NGOs, national government, or any other. For each project a description will be provided with regard to the implementing agency, the objectives and expected outputs of the project, the geographical location and area of the wetlands concerned, and the total budget including the starting and ending date. Reports or documents that have been prepared by these projects should be listed with a short summary, and indications as to where these are available
- ❖ Prepare a detailed bibliography of all publications that have been prepared at national level containing scientific and technical information on field experiences or guidelines regarding the development of wetland for agricultural purposes

¹ All materials are to be prepared in the English language. Any documents collected locally in another language should be accompanied by a short summary in English.

² For the definition of wetlands reference is made to the FAO concept paper.

- ❖ Prepare a list of courses (specialized or general) related to wetland development and management in agricultural universities, agricultural colleges and schools or elsewhere, obtain copies of the curriculum of the courses, and report on any other ad hoc or special training or capacity-building activity on wetlands at any level
- ❖ Based on the information collected from institutions and from people contacted during this consultancy, prepare a short³ assessment of the situation of wetland development and management in the country, a description of the possible needs for technical assistance at national level, and opportunities for regional exchange of knowledge and experience

It should be noted that the country reports were prepared by persons with different backgrounds. Some of the national consultants were irrigation engineers, while others were conservationists or teachers at the university. Although they all had the same Terms of Reference, their backgrounds had some influence on the content of the country paper. Thus, some country papers may be slightly biased towards the conservation aspects, while others are biased towards irrigation or agricultural development aspects.

Based on the information available in these documents, five key papers were prepared in fulfillment of a consultancy to analyze, compare, synthesize, and compile information gathered by national consultants in the SADC region on:

1. Wetland policies and strategies
2. Wetland characterization, classification and inventories
3. Projects and activities; exchange and dissemination of information on wetland use
4. Training and education on wetland use for agricultural purposes
5. The importance of wetlands for agriculture in SADC countries

These papers were prepared in readiness for presentation at this sub-regional workshop. They were presented as an introduction to each workshop session to stimulate and focus discussion during the working groups and plenary discussion for each workshop session. The conclusions and recommendations of each session were expected to form the core of proposals for a regional (SADC) action programme on the relevant issues, and a possible regional technical assistance programme yet to be developed.

5.2. Structure of the key papers

Wetland development and utilization in the different SADC countries is at different levels, depending on the different backgrounds, focus and values attached to wetlands at national level. Policies and strategies, characterization and inventories, projects and training activities undertaken, arising from the identified needs, would be expected to be equally variable depending on the circumstances prevailing in the specific country.

In the key papers, activities on any of the first four thematic areas referred to above are tabulated for each country, and this is accompanied with summarized accounts of any relevant information in respect to approaches, needs and opportunities. An indication of whether such activities are current or completed, and their relevance to the development and utilization of wetlands for agricultural purposes is reflected. These lists also indicate the publications, their sources and location wherever applicable.

³ minimum 20 pages, maximum 40 pages.

Brief summaries and reviews of the information on strategies to enhance and strengthen existing activities and/or programmes are provided in the body of the text, on a country basis, but only for those aspects considered relevant that cannot be contained in the tabulated summaries. At the end of each paper a summarized comparative assessment, conclusions and recommendations are given.

The fifth key paper pulls together the critical issues on wetland management and utilization within the region, based on the country papers and on the experience of the regional consultant, in an attempt to summarize the significant roles played by these ecosystems on the livelihoods of SADC communities.

Chapter 11 presents the bibliography, which includes the references cited within brackets in the different key papers as well as all references provided by the national consultants. This was thought to be a useful guide on information available in the different countries.

Chapter 6

Key paper 1: Wetland policies and strategies

6.1. Existence of national wetland policies in eight SADC countries

It is clear from the reports that in all the eight SADC countries the traditional policies on natural resources that operated at community level prior to colonial times have been largely replaced or diluted by introduced policies brought by the colonial administrations. The only country where policies on natural resources still have a strong traditional flavor is Swaziland. This is attributed to the retention of a traditional system under the leadership of the King and the fact that about 60 percent of the land area is held by the King in trust for the Swazi Nation. Through a series of Orders, the King addresses conservation, protection and management of the natural resource base of the country.

Analysis of all the eight reports from the region revealed a general absence of policies that are specifically formulated for improving the utilization and management of wetlands in the region. The majority of existing pieces of legislation are aimed at restricting utilization for purposes of conservation and are embedded in legislative instruments that cover the general natural resources which include water, soil and vegetation (Table 3).

Zambia has recently taken the initiative to put together a specific wetland policy. A 'draft wetlands policy' for Zambia is ready and was presented to stakeholders for their contributions at a National Workshop, held in Lusaka in May 2001. The existing Natural Conservation Resources Act (1970) has been amended with the enactment of the Environmental Protection and Pollution Control Act (1990), which is the parent legislation for wetland management in Zambia. The latter policy is currently broadly supported by other sectoral policies that include the Water Act (1949), Fisheries Act (1974) and the Agricultural Act (1960) in the implementation of wetland programmes.

Lesotho comes as a strong second in that it is presently in the final stages of enacting an umbrella environmental Bill 2000, which provides for effective measures such as EIAs and development of guidelines for conservation, development and management of the wetlands. The existing Land Husbandry Act (1969) and Water Policy (1999) restrict the use of wetlands.

In South Africa key policy elements around wetland conservation are found in the National Water Policy for South Africa, which introduced the groundbreaking concepts of the ecological reserve and an integrated approach to water resource management. Although key elements of wetland policy are also contained within the Environmental Conservation Act, National Environmental Management Act, Conservation of Agricultural Resources Act, National Water Act and the Policy on the Conservation and Sustainable Use of South Africa's Biological Diversity, there is no specific national policy on wetlands. The country has recently tabled a 'White Paper' on the Conservation and Sustainable Use of Biological Diversity, which makes specific references to the management of wetland areas.

Table 3
List of Policies inclined to wetlands in the SADC region

Country	Policy	Intended Effect	Development
Lesotho	<ul style="list-style-type: none"> Environmental Bill (2000) Land Husbandry Act (1969) National Water Policy (1999) Livestock and Range Management Policy National Environment Policy 	<ul style="list-style-type: none"> Improve conservation of the Maloti-Drakensberg ecosystem and reduce over-utilization of their range resources 	<ul style="list-style-type: none"> identify and enhance management of wetlands
		<ul style="list-style-type: none"> Improve conservation of the Alpine ecosystem 	<ul style="list-style-type: none"> improve management of the Alpine ecosystem
		<ul style="list-style-type: none"> Protection of rivers, river banks, wetlands 	
		<ul style="list-style-type: none"> General and specific orders, for standards for the management of rivers, river banks, lake, lakeshores and wetlands. 	
		<ul style="list-style-type: none"> Prevent accelerated soil erosion Restrict cultivation of wetlands Conservation of wetlands through sound management of rangelands 	<ul style="list-style-type: none"> encourages integrated catchment management
Malawi	<ul style="list-style-type: none"> National Environmental Policy (1996) Environmental Management Act (1996) 	<ul style="list-style-type: none"> Framework for the regulation 	<ul style="list-style-type: none"> promote the sustainable use and management of natural resources facilitate the restoration and maintenance of essential ecosystems and ecological processes enhance public awareness of the importance of sound environmental management promote cooperation of all stakeholders in the management of natural resources and the environment establishment of sustainable environmental utilization practices and integration of traditional knowledge

Country	Policy	Intended Effect	Development
		Control of use	
	<ul style="list-style-type: none"> Forestry Policy (1997) National Wildlife Act (1992) National Fisheries Act (1997) Water Resources Management Policy and strategies (1994) Land Resources Policy Agricultural and Livestock Development Policy National Irrigation Policy 	<ul style="list-style-type: none"> Harvesting of renewable resources Harvesting of renewable resources Harvesting of renewable resources Control on use Control on use Control on use Control on use 	<ul style="list-style-type: none"> some development aspects some development aspects some development aspects
Mozambique	<ul style="list-style-type: none"> Water law (1991) Land law (1997) Environmental law (1997) Environmental Policy National Irrigation Policy 	<ul style="list-style-type: none"> Restriction to use protected zones Restriction to use protected zones Restriction to use protected wetlands Regulatory framework – need for EIA 	<ul style="list-style-type: none"> encourages effective planning, management and use of appropriate technologies on wetlands
South Africa	<ul style="list-style-type: none"> National Water Policy Conservation and Sustainable Use of Biological Diversity (white paper) Environmental Conservation Act National Environmental Management Act Communal land tenure Traditional laws (homelands) Conservation of Agricultural Resources Act 	<ul style="list-style-type: none"> Legal instruments to restrict wetland use Legal instruments to control wetland use Legal instruments to restrict wetland use Legal instruments to restrict wetland use Access to land resources Regulatory (weakened) Regulatory on wetland cultivation (for permits to use – not applied) 	<ul style="list-style-type: none"> calls for sustainable use and management (white paper) sustainable harvesting and management (weakened) not applied in smallholder sector

Country	Policy	Intended Effect	
		Control of use	Development
Swaziland	National Land Policy (NLP) (1999) (Draft)	• Control of erosion and grazing	• maintain and introduce flora and fauna; integrated management
	Agricultural Policy (Draft)	• Guidelines for land use	
	Land Use Policy (Draft)	• Guidelines to use of different land classes	
	National Water Policy (Draft)	• Control and restriction to use	
	National Rural Water Policy (1998)	• Careful use of potable water supplies	
	Biodiversity policy (1997) (Draft)	• Maintain and conserve biodiversity	• call for restoration
	Forestry Policy (2000)	• Restriction buffers on waterways	
	National Environmental Policy (1998)	• Conserve natural heritage	
	Swaziland National Trust Commission Act (1972)	• Conservation of natural resources	
	Environment Bill (1998) (Draft)	• Integrated regulatory system	
	Natural Resources Act (1951)	• Restricts cultivation near riverine wetlands (33m)	
	Flora Protection Act (1957)	• Prohibits removal of indigenous flora	
	Plant Control Act (1981)	• Controls export and import of plants	
	Control of Tree Planting Act (1972)	• Prohibits planting of gum and pine along water courses	
	The Game Act (1991)	• Prohibits removal flora or hunting of fauna including aquatic species	• implement conservation measures
	The King Order No. 2 (1953)	• Control of soil erosion	
	The King Order No. 3 (1953)	• Conservation of water points in wetlands	
	The King Order No. 4 (1954)	• Conservation of natural resources	• frequent assessments submitted as reports to the King
Tanzania	The Swazi Administration Order (1998)	• Conservation of habitats and species by the King and Council	
	National Land Policy (1995)	• To secure land tenure system	
		• Downgrades wetlands (useless)	

Country	Policy	Intended Effect	Development
		Control of use	
	<ul style="list-style-type: none"> National Agriculture and Livestock Policy (1997) National Wildlife Policy (1998) National Fisheries Sector Policy National Forestry Policy (1998) National Water Resources Management Policy (2000) (Draft) 	<ul style="list-style-type: none"> Prohibits cultivation of wetlands Conservation of biodiversity Conservation of fish species Conservation of natural resources Conservation of water resources Transboundary issues on water quality, pollution, access 	<ul style="list-style-type: none"> promote aquaculture in water bodies integrated catchment management cooperative arrangements for shared water resources (SADC protocol)
Zambia	<ul style="list-style-type: none"> Environmental Protection and Pollution Control Act No. 12 (1990) Zambia Wetlands Policy (2001) (Draft) Natural Resources Conservation Act (1970) The Water Act (1949) The Fisheries Act (1974) The Zambia Wildlife Act (1998) Forestry Act (1999) Agricultural Act (1960) National Heritage Conservation and Commission Act (1989) 	<ul style="list-style-type: none"> Regulatory instrument on pollution and guidelines on EIA Regulatory Conservation of natural resources Regulates use and pollution of water Regulates fishing Conservation of wildlife Conservation of forests and trees Conservation Conservation of cultural and natural heritage 	<ul style="list-style-type: none"> environmental Council of Zambia established institutionalization, gender streamlining, socio-economic and governance in wetland development improvement of natural resources development of fisheries management of wildlife management of forests and trees management of agricultural resources
Zimbabwe	<ul style="list-style-type: none"> Traditional Lineage laws (very diluted) Water Act (1927) (revised in 1976 and 1998) Natural Resources Act (1942) (revised in 1952 and 1975) District Councils Act (1982) 	<ul style="list-style-type: none"> Conservation and protection Restricted use of wetland "public" resources Prohibited the cultivation of wetlands Allocation of land resources 	<ul style="list-style-type: none"> sustainable use

Whilst Malawi has made a number of amendments to cater for wetland management in the policies that govern its natural resources, these policies remain broad-based and suffer from lack of implementation. Some of the existing policies recently amended to take on board wetland issues include the National Environmental Policy (1996) and the Environmental Management Act (1996) that may, if implemented, contribute to the protection and sustainable use of wetlands.

In Mozambique there is no specific legislation, policy, strategy or national programme specifically concerning the development, management and conservation of wetlands. Mentions of protection of some wetlands are, however, specified within the Water Law (August 1991), Land Law (October 1997), and Environmental Law (October 1997). This is also mentioned in the Environmental Policy and the Regulatory Framework for Environmental Impact Assessment, which considers wetlands as sensitive zones, where environmental impact assessment is always required prior to the approval of its utilization.

In the case of Swaziland, the various policies that address natural resources mention wetlands in passing, and most of the policy and legislation frameworks that touch wetlands are contained in blanket statements that treat wetlands simply as riverine systems, such as river flows and riverbanks. Except for the Draft Land Policy (1999), Draft Biodiversity Policy (1997), and the Kings Orders that have some aspects of management, the majority of the policies emphasize control and restrictions on wetland use.

In Tanzania there is some preparatory work going on towards the development of a Wetlands Policy Framework and the eventual drafting of the National Wetlands Policy. The National Water Resources Policy (2000) recognizes the need to understand wetland systems, whilst the National Fisheries Sector Policy (1998) alludes to development in its reference to establishment of fisheries in water bodies.

The two restrictive legislative instruments on wetland utilization, viz. the Water Act (1927 - revised in 1976 and 1998) and the Natural Resources Act (1942 - revised in 1952 and 1975) remain in force in Zimbabwe. Despite available research evidence on the safety and advantages of wetland cultivation in the country, there has not yet been a substantive move towards the development of a progressive policy on wetlands. In the new Water Act of 1998 dambos are still viewed as no-go areas for secondary demand-using activities; the main purpose of these natural resources is to sustain streamflows and catchment yields in order to adequately satisfy the demands of diverse water users in a given catchment.

6.2. Current national strategies in support of wetland development

Different countries in the SADC region have adopted different strategies on the conservation and management of their natural resources. Some of this variation is reflected in the policies discussed in the preceding section. It is, however, important to recognize the fact that most of these countries have a background of colonial administration, which did not appreciate the traditional practices or knowledge systems applied to wetlands. In this respect, all of the countries, with the probable exception of Mozambique, went through a phase in which cultivation of or 'interference' with wetlands other than grazing, particularly using traditional systems, was legislated against.

The awakening call to utilize wetlands for other purposes such as cultivation dawned in different nations at different times. The push, in the majority of countries, has generally been from the smallholder farmers, except in South Africa where it has been the large-scale commercial farmers that benefited from the cultivation of such crops as sugarcane and maize in these ecosystems. In Zimbabwe, misuse of the wetlands by commercial farmers in the early 1930s resulted in the enactment of the legislative instruments that are still in force today.

In addition to the establishment of policy frameworks, the different strategies employed by the different countries are articulated and discussed below.

6.2.1. Participation in international protocols

Some SADC countries are signatories to international agreements and protocols that encourage sustainable utilization and management of natural resources. Malawi, South Africa, Tanzania (1999) and Zambia (1991) are signatories to the Convention on Wetlands of International Importance (RAMSAR Convention). Under this convention Tanzania has established the Malagarasi-Muyovozi RAMSAR Site. Zambia established the Blue Lagoon and Lochnivar National Parks in the Kafue Flats, and Chikuni region in the Bangweulu swamps as RAMSAR sites.

Malawi and Tanzania, and probably some other SADC countries, though not singled out in some of the reports, attended the United Nations Conference on the Environment and Development (UNCED) in Rio de Janeiro in 1992. As part of its obligations under a number of International Conventions concerning the environment, Malawi has produced a number of policies and legislation, which, while not specifically singling out wetlands, provide the policy and legal framework for the sustainable utilization and management of the wetlands.

Mozambique, Swaziland, Lesotho and Zimbabwe appear to have not yet ratified the RAMSAR convention. In the case of Mozambique, the report attributes this to the absence of identified, well confined and characterized wetland sites. This issue is reported to be under discussion among several governmental and non-governmental institutions in order to identify some of these sites and to carry out inventories in view of characterizing them. The reports on the other three countries are silent as to why the RAMSAR Convention has not been adopted.

The LandCare Programme in South Africa supports the general objectives of chapter 10 of the United Nations' Sustainable Development Agenda, entitled "Integrated approach to the planning and management of land resources", with the aim:

"To facilitate allocation of land to the uses that provide the greatest sustainable benefits and to promote the transition to a sustainable and integrated management of land resources. In doing so, environmental, social and economic issues should be taken into consideration. Protected areas, private property rights, the rights of indigenous peoples and their communities and other local communities and the economic role of women in agriculture and rural development, among other issues, should also be taken into account."

LandCare South Africa and the Government's land-care initiatives are guided by international conventions to which South Africa is party and signatory. Besides the RAMSAR Convention, these include the Convention to Combat Desertification, the Convention on Biological Diversity and the Framework Convention on Climate Change. The South African Wetlands Conservation Programme has been developed to ensure South Africa's obligations are met in terms of the RAMSAR Convention on Wetlands, and the aspects concerning aquatic ecology under the Convention on Biological Diversity. This programme is aimed at building on past efforts to protect wetlands in South Africa against degradation and destruction, whilst striving for the ideal of wise and sustainable use of the country's natural resources.

6.2.2. Participation in regional initiatives

Whilst the participation of the other countries is not clear from the reports, it is evident that Malawi, Zambia and Swaziland are participating in the SADC project on wetland conservation and utilization.

The proposal was initially developed by Zambia and was then adopted by the region. The project is to run for a second phase, having completed Phase 1. Swaziland expects to implement capacity-building, characterization of the country's wetlands, development of policy and legislation, and information sharing under this project. The indications from the report are that the resolutions and planned actions under this regional programme have, to a large extent, not been implemented by member nations.

The Tanzanian report shows that the country is also participating in the establishment of joint and cooperative arrangements for the development of some of the shared water resources. Among others, this includes the Southern Africa Development Community (SADC) in which Tanzania has signed and ratified the SADC Protocol on Shared Resources.

6.2.3. Initiation of environmental improvement programmes

These are national programmes, established to address the rehabilitation and increased utilization of the degrading natural resource bases. Not all countries have used this strategy nor has it been addressed by all with the same intensity and specificity.

In Malawi, the Environmental Support Programme (ESP) was prepared and established to assist in the implementation of the necessary actions on the conservation, sustainable utilization and management of the biological resources in the country, as identified in the National Environmental Action Plan (NEAP). The overall objective of the ESP is to integrate environmental concerns into national planning for socio-economic development (GoM, 1998a).

In Lesotho, the National Biodiversity Strategy explicitly calls for the design of measures that will protect threatened habitats and ecosystems such as the alpine bogs and mires and the afro-alpine ecosystems of highest mountains of the sub-region. Measures to be taken to achieve this objective are inventories and assessment of key mires, rehabilitation measures, scientific research, reduction of grazing pressure, and integrated watershed management. The strategy goes further by proposing sustainable range management alternatives such as the establishment grazing associations (GAs) and range management areas (RMAs). This approach to range management would reduce pressure on the wetlands through improved range productivity in the surrounding areas. This and other well-intended strategies under the Water Act are given as statements of intent; there is no evidence in the report that they are being implemented. In Lesotho, farmers are discouraged by all government agencies, including the Department of Water Affairs of the Ministry of Natural Resources, from using wetlands for crop production and livestock grazing. This is because wetlands are generally perceived to be environmentally sensitive systems that have to be conserved; hence the absence of effective strategies to use them for agricultural purposes. This strategy, though sound on plan, appears to have had limited application.

In Mozambique there are no national strategies to support the use of wetlands for agricultural purposes as these ecosystems are viewed as sensitive zones that should not be disturbed. Ironically, wetlands in Mozambique do not have a 'conservation status'. Those that are protected are only those that are located in Conservation Areas (national parks, game reserves, forest reserves, controlled hunting areas), which were established through successive legislation for conservation and protection of wildlife and biodiversity. It is worth noting that the current drive for conservation of wetlands in Mozambique is motivated almost exclusively by concerns related to the conservation of wildlife and biodiversity. Whilst this attitude runs through all the countries, it appears to be much more pronounced in this country.

In South Africa there are a number of environmental programmes that are being implemented to enhance the utilization of wetlands for agricultural purposes. These include the "Working for Water"

programme, which is expected to sustainably control invading alien species, thereby improving run-off and biodiversity, rehabilitating wetland systems and creating jobs. The programme aims to optimize the potential use of natural resources through a process of economic empowerment and transformation. In doing this, the 300 projects being implemented in the programme are expected to leave a legacy of social equity as well as legislative, institutional and technical capacity. The LandCare programme is designed to promote sustainable production technique that minimize damage to vegetation and soil. The Wetland Conservation Programme emphasizes the conservation of South Africa's wetlands so that the ecological and socio-economic functions of wetlands are sustained. It also aims at consolidating past efforts to protect wetlands in South Africa against degradation and destruction, whilst striving for the ideal of wise and sustainable use of the country's resources. These strategies by the South Africans are mainly targeted at rehabilitating and maintaining/conserving the natural resources and biodiversity. Little emphasis is placed on the agricultural applications of these ecosystems. It is, however, interesting to note that the actions and outcomes could be adopted for the wetlands put to agricultural use.

6.2.4. Strategies on improving access of wetland resources

In South Africa, the Land Reform programme has the objective to create equitable and fair land dispensation and to secure and promote the effective use of land as a resource within the context of sustainable rural development. A similar programme exists in Zimbabwe. Whilst these programmes may not have been specifically triggered by the demand or desire to access more wetland areas particularly, they have the effect of making such resources in the new resettlement areas available to previously excluded groups. In Swaziland, the King retains control over these resources on behalf of the people.

6.2.5. Strategic promotion and technical support to agricultural projects in wetlands

There is, generally, a limited number of agricultural projects in wetlands that are being supported in the SADC region. This may be attributed to the confusion and restrictions brought about by the national policies. The technical support and promotion of agricultural activities on wetlands is a very important strategy as it provides the backstopping capacity that is vital to the success of agricultural systems and production.

In South Africa there has been a noticeable decline in the applications for wetland cultivation. For instance, in the KwaZulu-Natal Province no applications have been received in the last three years (*Personal communication to Donovan Kotze by P Botha, Department of Agriculture, Directorate: Agricultural Land Resources Management*). It has however, been observed that most new agricultural developments in wetlands are currently being implemented by individual subsistence/small-scale farmers, who are largely unassisted by government or any other development organizations. At provincial level, however, the Departments of Agriculture continue to support the cultivation of wetlands within community gardens developed in past years, many of them prior to the mid-1980s. Similarly, although the sugar industry also continues to support the maintenance of cultivation within wetlands, which were legally developed, they no longer support development of new wetland areas to sugar. Two recent projects have been promoting the cultivation of indigenous plants, namely *Juncus kraussii* and *Zantedechia aethiopica*, in wetlands. Although not its primary objective, a LandCare project at Mbongolwane includes the promotion of controlled and sustainable cultivation of wetlands.

In Swaziland, it is clear from the report that there is a general perception that agricultural activities lead to wetland degradation; hence there is nothing in the report to suggest deliberate strategies and efforts to promote wetland cultivation in that country.

The Zimbabwean Government has allowed and supported, with the help of some donor funding, research to be conducted on the utilization of wetlands for agricultural purposes. This strategy, though initially viewed as unnecessary by some, has provided the basis for further developments in the management of wetlands for improved livelihoods that is being promoted by development agents as demanded by communities. This research has served to improve the understanding of wetland dynamics as well as demonstrating the potential of wetlands in agricultural production. Zambia, Malawi and, to some extent, South Africa also have some valuable research information on the response and potential of wetlands under agricultural use.

Most countries have maps and aerial photographs showing the location of wetlands and whilst these may not have been made with this intention, these resources have been made available nonetheless. Such institutional support has been taken advantage of, and put to good use, by all the countries, albeit to different degrees. One of the many examples is the University of Dar es Salaam, where the Library has a lot of information and data available. This includes Maps (established through the National Reconnaissance Level Land Use and Natural Resources Project, 1997) available to the public in both print and digital formats.

In Mozambique, the National Institute for Agronomic Research (INIA) is carrying out a research programme on the use of '*machongos*' for crop production in Southern Mozambique and possesses an important soil database on wetlands occurrence in the country, with respective characterization, classification and extension.

6.2.6. Strategic organizational/institutional arrangements for wetland cultivation

Institutions, particularly in governments, are set up to provide specific services to the communities. Communities, on the other hand, have multiple requirements and needs in their daily running, which all need to be addressed and very often at the same time. The need for coordinated service delivery by institutions and organizations is often neglected and yet such services are vital to avoid confusion, duplication of efforts and, at times, conflicts.

Zambia established the Environmental Council of Zambia (ECZ) and gave it the mandate to coordinate national wetlands conservation initiatives. A Task Force was then formed to spearhead the development of Zambian wetland programmes. This arrangement facilitated the compilation of the National Wetlands Status report, which highlighted the values, threats, development and conservation issues in Zambian wetlands. This formed the basis for the formulation of the Wetlands Policy, which has been drafted and presented. The process of preparing the National Wetlands Policy involved desk studies, visits to Lusaka based central institutions and visits to field sites, which included fact finding and local community workshop missions.

The Zambian experience highlights the fact that various institutions, such as the Department of Water Affairs and the Water Board under the Ministry of Energy and Water Development (MEWD), Zambia Wildlife Authority (ZAWA), Forestry Department (FD) and Department of Fisheries (DoF), perform specific tasks in wetland related resource management. Conflicts were reported to arise among these departments when it came to the overall management of the natural ecosystems of the wetlands, as each department preferred to carry out only its mandate for the ecosystem. This necessitated the development of the Wetlands Policy, which integrated the development functions, streamlined operations, and served as a focal point.

A second example comes from the Malawi report, in which the National Council for the Environment (NCE) is shown to act as a government watchdog that ensures cooperation between individuals, communities, government agencies, and non-governmental organizations concerned with the protection

of the environment (Study No. 8). Its mandate is provided for in section 10 of the Environmental Management Act and has the following roles:

- ❖ Provide high level political support for environmental management and protection
- ❖ Ensure that environmental concerns are addressed at all levels
- ❖ Review environmental policies formulated and advise cabinet
- ❖ Play a role in arbitration and resolving conflicting proposals from bodies and individuals on environment
- ❖ Review ongoing and proposed activities

Members of the NCE are the Secretary to the President and Cabinet, Principal Secretaries, General Manager of the Malawi Bureau of Standards, General Manager of National Herbarium and Botanical Gardens of Malawi, Malawi Chamber of Commerce, one Natural Resource NGO, and member representation of National Commission for Women in Development. The Environmental Affairs Department is the Secretariat for the NCE.

In the Zambian experience, formal governance structures at district level include the District Administrator's office, the District Council, and departments of major line Ministries operating at district level. In addition, there is a wide range of NGOs that operate in the districts. These institutions work hand in hand with the traditional leadership within the district, which includes Chiefs and their Headmen. This particularly needs to be recognized and attended to as there are no formalized structures directly responsible for wetland conservation, utilization and management at community level.

6.2.7. Incentives as a strategy to catalyze action and participation

It is an indisputable fact that people take action for a reason and that there is always the unwritten question in everyone's mind as to "what is in it for me?". This raises the important issue of incentives that can accrue to participating communities in natural resources management programmes.

In the Zambian experience community concerns at village level, such as distances to game hunting licensing areas, the license fees for hunting, input supplies and the need for local game-based cottage industries, are some of the issues that the policy objectives have sought to address in order to create adequate incentives.

In South Africa, the production of indigenous crops that have a market value brought incomes to the communities. In the non-agricultural environmental projects such as the Work for Water programme, coordinated by the Department of Water Affairs and Forestry (DWAF), Department of Environmental Affairs and Tourism (DEAT) and National Department of Agriculture (NDA), the incentives to the communities appeared to be drawn from the employment opportunities that were created for the surrounding communities. In addition, the three departments also each administer largely incentive-based programmes of relevance to wetlands, including: the DEAT Wetland Programme (including administration of the RAMSAR Convention) and the LandCare Programme (administered by NDA).

In Zimbabwe, the production of higher value crops and stable crop yields by communities that had been threatened by food shortages provided a household incentive that appears to drive participating communities to adopting the developed cultivation system. The wetlands acquire added value in the lives of the communities, and their need to conserve such a resource base has become obvious.

6.2.8. Strategy of wider stakeholder involvement in the development of wetlands for agricultural purposes

It is very apparent from most of the reports that the SADC countries have dialogued with international organizations, donor communities, NGOs and, to a lesser degree, the private sector. These organizations have, in turn, spearheaded activities in natural resources management, wetland management in particular. It is also apparent that whilst most of the government initiatives have been directed towards the enactment of policies that established frameworks for control and conservation of natural resources, these other organizations focused on conservation and utilization.

There are 21 NGOs currently active in environmental management in Malawi. In Mozambique, despite the limited attention paid by government to promoting agricultural production of wetlands, there is an FAO Special Programme for Food Security (SPFS) operating at the Ministry of Agriculture, which promotes some small-scale irrigation projects in alluvial flood plains. This same programme is also operational in most of the other countries. The Regional Office for Southern Africa of IUCN (IUCN-ROSA), together with the Canadian International Development Agency (CIDA), managed the Zambesi Basin Wetlands Conservation and Resource Utilization Project (ZBWCRUP), aimed at ensuring the wise use of natural resources of the wetlands of the Zambezi basin. It was focused on four project sites in Zambia, Namibia/Botswana, Malawi and Mozambique. In Mozambique the project sites were the lower Shire and the Zambezi Delta. The project was initiated in 1996 and finished in the beginning of year 2000. Several reports were produced and they are indicated in the list of main publications related to wetlands.

In Mozambique, the Cabinet for the Zambezi Valley (GPZ), through the Spatial Development Initiative (a project funded by the Development Bank of Southern Africa), is undertaking a set of basic studies for the Zambezi valley development, the most important wetland area in central Mozambique, including the projection of the potential for irrigated agriculture.

Similar arrangements exist in all the other remaining countries, and the organizations involved are given in the paper on projects and activities in the SADC countries (chapter 8). A very pertinent observation was, however, highlighted in the South African report and related to the vital need for a national strategy, with multi-stakeholder “buy-in”, for the conservation and wise use of wetlands to succeed.

6.2.9. Capacity-building as a strategy for enhancing the agricultural use of wetlands

The Malawi report presented a classic framework for capacity-building at both community and institutional levels. This is cited in this report as one example of the many variants that are being implemented in the region.

At the community level in Malawi, a need was identified to enhance the administrative, technical and financial capacity of the individual beneficiaries, and also of the social structures in charge of managing wetlands. The principal of ploughing back the revenues into the communities has been accepted as a good way for the community to see the benefit of proper utilization of the wetlands. However, better and more transparent means of handling group revenues, such as fines, revenue collected from various enterprises, need to be instituted within the social or village structures.

The use of community based organizations (CBOs) as a channel for wetland utilization programmes is reported as deserving encouragement. However, according to the Malawian experiences, most CBOs have been observed as having many problems, some of which are:

- ❖ weak self-organizational capacity
- ❖ high dependence syndrome

- ❖ lack of self-confidence
- ❖ still act as objects of development
- ❖ low level of women involvement or participation; low gender-awareness
- ❖ lack of skills in leadership, organization, planning, management, and marketing
- ❖ lack of written terms of reference

It is recommended that these CBOs should be given the legal framework necessary for them to carry out their duties effectively and enhance accountability. A legal framework also reduces the unfavourable influence of strong local leaders bent on taking advantage of poor farmers.

The Malawi society, and indeed many of the SADC indigenous communities, retains strong traditions of self-help through its informal system. At village level, task sharing is a social obligation as much as an economic necessity and is vital to the survival of the community (Milazi, 1997). The development of community-based organizations needs to build on these strengths, while overcoming the political mindset, which has been carried over from previous administrations.

The report observes that community-based organizations in villages usually remain specific to the objectives of the development programme that has promoted them. It is expected that with decentralization, the drive towards integrated district planning will provide a better foundation for the formation of community-based organizations that have integrated objectives for the better management of the environment.

At national level, most institutions lack specific human resources responsible for the management of wetlands. This is an observation that would apply to all countries in the region. At present, in Malawi, the key institutions responsible for the conservation and sustainable utilization of protected areas are the Department of Parks and Wild Life, and the Forestry Department. Other institutions need to be empowered, through their policies, acts and means, to create awareness and enforcement mechanisms of the regulations at grassroots levels. The research capacity of all departments responsible for managing the country's biological diversity is limited (GoM, 1998b).

At national and local levels there is urgent need for education and awareness-raising about wetland values, conservation, management, and utilization imparted through participatory approaches. At the moment, wetland rehabilitation, restoration and utilization, in practice, do not appear to be a priority of the Malawian Government or the nation in general. This attitude reflects the general picture in all the other national reports.

6.3. Regional policies and strategies on wetland use for agriculture

All the papers, except for those on Lesotho, Malawi, Swaziland and Zambia, were very silent on regional policies or activities. This could be attributed either to the scarcity of such information, the absence of such initiatives, or to the mere fact that the national consultants had not thought of covering that component.

The Lesotho, Swaziland and Zambian reports referred to the existence of the SADC-facilitated Wetland Project, which has gone through Phase I and is moving into Phase II. The project was developed under the umbrella of the Soil and Water Programme as managed through SACCAR before the SADC chapter changed its operational arrangements. The basic thrust by SACCAR was to facilitate training and the development and dissemination of appropriate technologies in soil and water management within the region. In this respect, a Steering Committee that met regularly had been established and comprising nationals from the participating countries. The Steering Committee members

formed the focal points in each country and facilitated communication and development of national programmes affiliated to the region. The Zambian group formulated a Wetland Development Programme that seemed appropriate, and was approved by SACCAR and eventually endorsed as a regional project that could be fine tuned for each country. Details on the outcomes of this project were not made available in the papers. Suffice it to say that the Lesotho and Swaziland reports indicated that most of the planned activities under this project had not been implemented. Zambia, despite being the forerunner on this project, did not articulate or decipher details of the activities related to this project.

Through personal communications, it has been indicated that the Phase II of the Soil and Water Programme will soon be put on course. The funding and personnel appear to have been identified. It was appreciated that more details on the regional policies and activities need to be collated than was made available.

International organizations, including FAO, IUCN, WWF and IWMI among others, are scanning the needs of the member countries through workshops and meetings in the hope of developing regional initiatives on wetland conservation, utilization and management through normative programmes.

6.4. Impact of national policies on wetland use for agriculture

When policies are established it is expected that they provide guidelines, and a conducive environment and support for the implementers and communities to operate effectively. It is also expected that, once policies are passed, they would be appropriately translated, implemented or enforced by the responsible authorities.

Information supplied from the reports largely indicates that those policies that closely relate to wetland management are generally not well-administered, thereby resulting in limited effect on what they are intended for, be this control of resource use, conservation or management.

In Malawi, the report acknowledges that whilst considerable progress has been made in the development of policies related to the conservation and management of natural resources, there remain major constraints, which include “a lack of awareness and understanding of these policies and acts by a section of the population which is critical in wetland utilization and management: rural population”. Furthermore, “Most institutions lack the capacity, be it human or otherwise, to enforce regulations where the need for external interventions is required”.

In South Africa, the report highlights the “shrinking capacity of the Department of Agriculture” and indeed, other government institutions to administer their responsibilities. Reasons for this loss of capacity are cited as being the cut in the budgets for agriculture and land and the resulting loss of skilled staff, many of whom have resigned or taken voluntary severance packages. Furthermore, there is a strong impression that many departmental staff are getting paid for doing nothing (Greenberg, 2000). The report summarizes that “thus, across the country farmers will just have to add a drought in government support to their list of difficulties”.

In Zimbabwe, encroachment into wetland areas by smallholder farmers in communal areas continues, despite the existence of the restrictive legislative instruments. This is pressured by the land shortage in these areas coupled with the recognition for more reliable soil moisture conditions in the wetlands.

6.5. Conclusions

Within the policy framework on wetland utilization for agricultural purposes in the SADC countries, a number of conclusions could be drawn based on the materials and information made available. These conclusions are presented in bullet form and include the following:

- ❖ Governments in the SADC region have almost exclusively enacted environmental policies that are focused mainly on the control and conservation of natural resources and have ignored the management, utilization and beneficial aspects of these resources to the communities.
- ❖ As a result of the above, none of the countries have specific policies or strategies on the conservation, utilization, and management of wetlands for agricultural purposes. The few countries, including Malawi, South Africa and Zambia, that have realized the need for such a policy are yet to have their 'drafts' presented and passed by their respective policy-endorsement institutions.
- ❖ Wetland cultivation remains limited in the region, and in those situations where it is practiced, it is being done either under special circumstances or illegally, as there is a general official view that wetlands are not suitable for cropping. This perception was entrenched by the colonial administrations that had neither experience nor appreciation of the traditional systems. This was despite the fact that those administrations found wetland cultivation being practiced successfully in the region.
- ❖ Initiatives for developing wetlands for agricultural production are generally being spearheaded by non-governmental organizations, international organizations and communities. Government institutions have lagged behind on such initiatives and are only beginning to appreciate the need for this.
- ❖ It would be generally observed that most of the policies that govern the management of natural resources, and in particular wetland resources, were enacted during the colonial era. Those few policies with recent dates of enactment are amendments of the older "root policies", which have been seen to be inappropriate.
- ❖ It appears that both the amended and more recent policies on natural resources management are still inappropriate as they remain silent about the utilization of these resources.
- ❖ Institutional arrangements of public service institutions are failing to adequately respond to the needs of smallholder farmers, custodians and users of wetlands and other natural resources.
- ❖ Communities at grassroots level have limited organizational and technical capacities to deal with the policy issues surrounding wetland cultivation in all the countries.
- ❖ Current strategies for promoting wetland cultivation are largely attributable to non-governmental organizations, and a few visionaries within public institutions that have realized the importance and potential role of wetlands in agricultural production. This has been supported through the evidence shown by those farmers who have encroached upon and cultivated the wetlands.
- ❖ There is a serious lack of information on the distribution, characteristics and response of wetlands to cultivation in the region. This could largely be attributed to policies that classified wetlands as being 'useless' and 'no-go' areas.

6.6. Recommendations

The recommendations targeted on policy and strategy issues, as drawn from the paper presentations, include the following:

- ❖ National policies that currently regulate the protection and conservation of natural resources need to be amended in order to infuse into them the aspects of utilization and management by communities.
- ❖ All countries need to formulate and enact policies specific to wetlands that are used for agricultural purposes. This should be formulated with the full participation of the resident communities that are the custodians of these resources. Lessons on the processes involved could be borrowed from the Zambian experiences.
- ❖ Governments need to build the support services (research, extension and regulatory) for agricultural activities on wetlands, as this will provide much needed backup services for sustainable utilization of these resources.
- ❖ There is an urgent need to collate all the information that is currently available, and to generate that which is not available in respect to wetlands used for agricultural purposes.
- ❖ There is a need to build capacities and reorient mindsets within governments, institutions and communities as a process in developing wetlands for agricultural purposes.
- ❖ Institutions have to change the way they operate, and take a more collaborative and multi-disciplinary approach to service provision particularly in wetland development, as its requirements are multifaceted.
- ❖ Service institutions and organizations need to recognize the importance of community organizations and should, in this respect, encourage and facilitate their establishments and operations.
- ❖ At this stage all countries would need support in driving the policy reforms and the establishment of specific wetland policies appropriate to national conditions and circumstances.

Chapter 7

Key paper 2: Wetland characterization, classification and inventories

7.1. Definitions of wetlands

There are many definitions and names given to wetlands the world over, and the countries in the SADC region have made their contributions to these variants. It is appreciated that there has not yet been one definition or name that is considered as being universal, which goes to show the level of variability in these ecosystems. For the purpose of the FAO programme on wetland development and management, aiming specifically at the improved agricultural use, wetlands have been defined in the concept paper in chapter 2 as "... areas that have free water at or on the surface for at least the major part of the growing season. The water is sufficiently shallow to allow the growth of a wetland crop or of natural vegetation rooted in the soil" (Brinkman, R. and Blokhuis, W, 1986). Although the national consultants, in the Terms of Reference, were requested to adhere to this definition in their analysis, some countries also provided other definitions.

This key paper presents some issues, on a country by country basis, highlighting the locally accepted or formulated definition(s) and names, followed by a comparative summary.

7.1.1. National definitions given in the country papers

Lesotho: The Lesotho report did not provide a generic definition of a wetland. However, it did provide the different types of wetlands that occur in Lesotho and these will be referred to under the appropriate sections of this report.

Malawi: In Malawi, a wetland, referred to as 'dambo' in the local language, is described as "any permanently or seasonally wet land in valleys, depressions, or floodplains with open herbaceous vegetation, mainly grasses and sedges, and an absence of trees" (FAO, 1996).

Mozambique: The Mozambique report adopted the definition given in the FAO Concept Paper.

South Africa: Wetlands are locally referred to as 'vleis', a word borrowed from the Afrikaans language. The South African report adopted the definition of wetlands given in the FAO Concept Paper.

Swaziland: In Swaziland, wetland areas are often referred to as 'sponges' or 'bog systems', since they absorb rainwater and release it slowly during the dry period. The name 'vlei', borrowed from the Afrikaans language, is also used. It appears that the Swaziland report highlighted the descriptive definition of wetlands as "distinguished by the presence of water, at the surface or within the root zone; wetlands commonly have soil conditions that differ from the adjacent uplands; wetlands support vegetation adapted to wet conditions and conversely are characterized by absence of flooding intolerant vegetation" (Mitsch and Gosselink, 1993).

Tanzania: In the Tanzanian report wetlands were defined as “swamps or low-lying areas of land, which are subject to inundation, usually seasonally”. A local name, “Vinyungu”, was reported as being used by some communities for cultivated wetlands in Tanzania.

Zambia: Wetlands are generally referred to as dambos, a word derived from the local language. In the case of Zambia, the report indicates dissatisfaction with the existing definitions and mentions that a decision to develop an appropriate one for the country has been taken. For the time being, it appears the following description would be used: “areas of overlapping terrestrial and aquatic systems, where the water table is usually at or near the surface or where the land is covered by shallow water all year round or for a very good portion of the year”.

Zimbabwe: In Zimbabwe wetlands are known as dambos (Chichewa language), *vleis* (Afrikaans language), ‘mapani’ or ‘matoro’ (Shona language), and ‘inuta’ or ‘amakhaphozi’ (Ndebele language). The Zimbabwean report gives the definition of wetlands that is documented in the Natural Resources Act as being: “Land which is saturated within 150 mm from the surface of the land for the major part of a season of average rainfall or exhibits the soil profile one or more of the following features: (i) mottles or rust-like stains in the root channels 150 mm or less from the surface of the land; (ii) black top soil horizons very rich in organic matter overlaying pale sands; (iii) dark grey or black heavy clay showing considerable surface cracking when dry and without marked evidence of self-mulching”.

7.1.2. Other definitions cited in the country papers

A number of definitions developed by various people and organizations from the region and beyond were cited in the national reports. These are presented for information and to show the range of these definitions.

The RAMSAR Convention (1971) defines wetlands as being: “areas where water is the primary factor controlling the environment and the associated plant and animal life. They occur where the water table is at or near the surface of the land, or where the land is covered by shallow water”.

Under Article 1.1 of the Convention on Wetlands of International Importance of the RAMSAR Convention, wetlands are further defined as: “areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including area of marine water the depth of which at low tides does not exceed six metres”.

Article 2.1 of the Convention states that wetlands: “may incorporate riparian and coastal zones adjacent to wetlands, and islands or bodies of marine water deeper than six metres at low tide lying within the wetlands”.

Marchand (1988) defines wetlands as “an area, which contains, at least during part of the year, enough water to develop specialized communities of plants and animals adapted to water-logged conditions”.

The Fish and Wildlife Services of the United States considers wetlands as “lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water” (Cowardin *et al.* 1979; Breen *et al.* 1997).

7.1.3. Summary

From the definitions given above, it is obvious that there are variations in the definitions of wetlands in the region.

Lesotho, Mozambique and South Africa adhered to the definition given in the concept paper. This does not necessarily suggest that local names and definitions do not exist. Malawi and Zimbabwe

developed their own definition of these ecosystems, whilst the other countries are adopting definitions by international organizations. Zambia has realized the inappropriateness of some of these definitions, given the types of wetlands found in that country, and hence it is in the process of developing its own. In particular, it differed with the FAO adopted definition on the use of the term 'growing season'. The absence of a regionally-accepted definition of the same type of ecosystem has been highlighted.

Some definitions, particularly from the international platform, consider artificial impoundments as wetlands. Whilst this may be technically sound, the focus on this exercise is on naturally occurring wetlands that have potential for agricultural use.

Whilst not all national names for wetlands were given, it is appreciated that these are as varied as the languages and their dialect variants in the region. Most technical people in the region have since adopted the word 'dambo', which owes its origins from Zambia and Malawi, and there is a good chance that it could become a name for wetlands in the SADC region, particularly for those used for agricultural purposes.

7.2. Characterization, classification and inventories of wetlands in the eight SADC countries

Although many scientific publications provide extensive descriptions of the flora and fauna of wetlands, the soil, the climatic conditions and the landscape, little work has been done on systematic characterization and classification, nor the areas covered by different categories of wetland (chapter 2). This paper extracts the examples where characterization has been attempted at national level, as presented in the national reports. Whilst this paper attempts to be as inclusive as is possible, based on the national reports, there is no claim to it being exhaustive of all the work done in the region.

7.2.1. Types, occurrence and descriptions of wetlands in the eight SADC countries

Different countries, in partnership with international organizations, have made assessments of what types of wetlands exist in their country, in respect to the broad categorization of such ecosystems. The terms and classification guidelines at this level are borrowed from the international systems and have been equated, occasionally modified and applied to those occurring in the region.

Table 4 shows the range of wetlands that occur in the region according to the Cowardin *et al.* (1979) and Chabwela (1991) categorization system adapted for the region. The information from the country papers indicates that all five types of wetlands are found in the SADC region. Of the eight SADC countries studies, only South Africa, Tanzania and Mozambique have the full range within their boundaries given that they have oceanfronts. The other five countries do not have the marine and estuarine systems since they are landlocked.

Although wetlands are reported as being most extensive in areas where the physiography is flat and there is an adequate water supply, wetlands are found across the full climatic and physiographic variability represented in the region. Consequently, wetlands are very diverse, ranging from high altitude wet meadows in Lesotho with short herbaceous vegetation to swamp forests on the coastal plain of South Africa and Mozambique. Various criteria have been used to match and group wetlands, including physiography, climate, flooding occurrence, soil groups, vegetation, natural regions and provincial boundaries. As expected, these are very area specific and used for local identification.

Agricultural development takes place almost entirely within palustrine and riverine wetlands systems. All riparian and floodplain wetland areas *outside* of a well-defined stream channel are classed as palustrine. For information on the other wetland types see Breen *et al.* (1997).

Table 4
Types and description of wetlands in the SADC region

Type of wetland	Description	Occurrence by country	Distribution	
			Area (km ²)	% of country
Marine systems	Includes sub-tidal (the portion that is continuously submerged and generally characterized by coral reefs and sea grass bed), and the inter-tidal zone (which forms the main shore, and it includes mud flats and sand beaches).	Mozambique South Africa Tanzania		
Estuarine system	Includes sub-tidal and tidal portions that are usually semi-enclosed by land but with sporadic access to the sea; and in which fresh and seawater are allowed to mix. In Southern Africa this system is predominantly of the river delta formation.	Mozambique South Africa Tanzania	8 546	1.1
Lacustrine system	Includes wetlands and deep-water habitats situated in topographic depressions or dammed river channels. The main types are the large freshwater lakes, the alkaline lakes and plains, volcanic lakes, and man-made lakes.	Malawi Lesotho Mozambique South Africa Swaziland Tanzania Zambia Zimbabwe	10 977	1.4
Riverine systems	Comprises the perennial and seasonal rivers and streams, features of which include floodplains, swamps, and marshes.	Malawi Lesotho Mozambique South Africa Swaziland Tanzania Zambia Zimbabwe	42 070	5.3 4
Palustrine systems	Dominated by trees, shrubs, and persistent emergent of marsh, swamps, bog, fen, and dambo (molapo, mbunga, naka, vleis) habitats. The fresh water habitats of this group occur around ponds and springs, or along a headwater seepage.	Malawi Lesotho Mozambique South Africa Swaziland Tanzania Zambia Zimbabwe	4 800 18 888 12 800	 1.4 2.4 10 3.6

7.2.2. Characterization, classification and inventory activities undertaken in the region

The inventories and characterization of wetlands in the SADC countries, and their objectives, are identified and collated under this section. These activities are summarized in tables, and minimal descriptive text is included in the main body of the report to support the tables. This approach has been adopted as a strategy to summarize and is a compromise between copious amounts of descriptive text and summarized tabulated data.

Lesotho:

Different specialists have conducted several inventories and developed a series of classification classes of wetlands of Lesotho. Five major classification exercises have been done in Lesotho, which include a botanical study (Backups, 1988), classification and mapping of wetlands of the Maloti/Drakensberg by the Institute of Natural Resources (1988), classification of wetlands at high elevation (Schwabe,

1990), classification of southern African wetlands (Breen *et al.* 1997) and the classification of highlands wetlands (Marneweck and Grundling, 2000). The objectives and outputs of these initiatives are given in Table 5.

Table 5
Characterization, classification and inventory activities undertaken in Lesotho

Activity/support	Method/system/citation	Objective	Outcome
Provisional study	• Backups (1988)	Botanical study	• Assessment of potential resources
Classification and mapping	• Remote sensing technique (SPOT) • Satellite imagery • Aerial photographs • Geographic Information Systems (GIS). • INR of South Africa	Classification and mapping of wetlands in Maloti/Drakensberg in 1989	<ul style="list-style-type: none"> • A key for wetland classification developed in two parts; the first described the mires while the second describe the marshes. • Mires occur at high elevations (above 2750m asl) and were divided up into bogs and fens, with the bogs being made of two types (i.e. slope and raised bogs) and the fens being made of two types (i.e. slope and valley fens). The marshes occur at the lower elevations (below 2750m asl), have clay soils, a water table below the surface of the soil and have tall sedges and grasses.
Classification	• Method as above • Schwabe (1990)	Comprehensive classification of wetlands at high elevation	• Categorized high elevation wetlands into: mires, marshes and tarns
Classification	• Method unspecified • Marneweck and Grundling (2000)	Classification of the wetlands of the highlands of Lesotho	• Identified and described the following wetlands: Oxbow with footslope, midslope fens, Valleyhead fen, Valleyhead wetland, Footslope fen, Midslope fen, Midslope wetland, Footslope wetland, Crest wetland
Categorization	• Method unspecified • (IUCN publication 1997)	Publication of an overview of wetland types in the SADC region, highlighting their key characteristics and functions	<ul style="list-style-type: none"> • Identified Marine systems, Estuarine systems, Riverine systems, Floodplains, Swamps, and Lacustrine systems in the region • Identified threats facing wetlands systems

Amongst these inventory and classification exercises, the one by the Institute of Natural Resources (INR) from Pietermaritzberg in 1989 focused on the issues that could be applied in improving the utilization of wetlands for agriculture. The others were more conservation oriented. The study mapped and classified different wetland types in the Maloti/Drakensberg catchments, with the aid of remote sensing techniques of SPOT satellite imagery and colour aerial photographs. Geographic Information Systems (GIS) technology was used in the production of maps. Field verification of wetland classifications and distributions was also performed using multivariate programmes, such as DECORANA and TWINSpan. The environmental parameters responsible for the distribution of the wetlands and their plant communities were determined using stepwise multiple regression. The wetlands were classified using a key developed by Cowardin *et al.* (1979).

In this study, Wetland Evaluation Technique (WET) was also applied to assess the functions and values of different wetland types. The results were compared to field and scientific analyses of the wetland's functions. Status of the wetlands in the study area was identified using spectral signature, and physical and biotic indicators. The rate of a wetland degradation at the source of Sani river was calculated using aerial photographs and the impact of land use practices on the wetlands were identified. The results revealed that human activities, including cultivation and livestock grazing, have adversely affected the wetlands.

The attitudes of the local communities were assessed to determine the social value of the wetlands. In general, local communities appreciated the value of wetlands but continue to use them unsustainably due to lack of options. The conservation status of the wetland and perceptions of local communities about the value of wetlands were then used to develop a management strategy for conservation and sustainable use of wetlands.

The Lesotho report repeatedly expresses concern over the environmental degradation, of their wetlands in particular. Two wetland types, unique to Lesotho, are reported as being threatened with degradation due to overgrazing and mismanagement. These wetland types are the *mires* and the *tarns* that are seen as important components in the hydrological dynamics of the country. They belong to the palustrine wetland systems.

Mires (bogs and fens) are wetlands of the Holocene period and consist of peat-loam deposits. They commonly occur in riverheads and tend to purify and regulate the flow of water into streams. The vegetation is predominantly made up of mat-forming small plants. Within mires are ponds that are found on flat open areas. A conspicuous feature of bogs is the presence of hummocks. The hummocks are possibly a result of the process of succession, where shallow pools are occluded by algae and bryophytes, paving way for invasion by higher plants and leading to the development of hummocks (Hughes *et al.* 1992).

Tarns are shallow pools, ranging from a few centimetres to a metre deep (Hughes *et al.* 1992). They occur in depressions in Cave Sandstone within the montane area. They consist of three main plant communities: floating communities, submerged communities, and persistent emerged communities. The peripheries of the tarns consist of two hydrologic regimes, namely saturated and periodically saturated areas.

Malawi

Whilst there are a number of detailed descriptions of the physical and biological components associated with specific wetlands in Malawi (flora, fauna, soil, climatic conditions and landscape features), it is reported that there has not been a systematic characterization and classification nor a determination of the areas covered by different categories of wetlands in Malawi. Four main attempts at characterization, classification and inventories have been made in Malawi, which these include the following: Socio-Economic and Production System (SEPS) Study of Wetland, which concentrated on dambos (FAO, 1996), Wetlands Conservation Programme for Africa (Chabwela, 1991), Land Resources Evaluation Project (FAO, 1992) and the Directory of African Wetlands (Hughes *et al.* 1992). The objectives and outputs of these initiatives are given in Table 6.

Table 6
Characterization, classification and inventory activities undertaken in Malawi

Activity/ support	Method/system/ citation	Objective	Outcome
Inventory *FAO&IFAD	• "SEPS classification".	Social-Economic and Production System (SEPS) Study of Wetland (1996) (concentrated on dambos)	• Increased understanding of the characteristics, needs, and priorities of the communities who have access to wetlands, and how wetland use can be improved
Inventory SADC/IUCN (1991) (NORAD funding)	• "Mzima/SADC/ IUCN Classification". Chabwela (1991)	Wetlands Conservation Programme for Africa (Sponsored by NORAD)	• Compilation of wetland surveys conducted in SADC countries, including Malawi • Inventory of the wetlands of the region, and as much relevant information as possible for use in formulation of appropriate measures for conservation and sustainable use of the wetlands
Classification UNDP/FAO		Land Resources Evaluation Project (project No. DP/MLW/85/011 of 1991). (This was not a wetland classification per se. It mostly gives a description of land units in physiographical terms, which can then be used to delineate and classify wetland areas)	• Most comprehensive appraisal, description, and maps of the physical environment of Malawi, in terms of agro- climate, soils and physiography • The reports also depict the spatial distribution of the agro-climatic zones, soil families and vegetation types on 1:250 000 maps • Land Units, which are a combination of a soil unit and an agro-climatic zone also provided
Descriptions/ characterization	• Hughes, R.R. and J.S. Hughes (1992)	A Directory of African Wetlands (Book) (biodiversity assessment, gaps and constraints)	• Contains descriptions of the wetlands of Africa • A description of 17 wetlands of Malawi is given

Further to these activities the dambo, a specific type of wetlands that falls within the palustrine system and has the greatest potential for agricultural use, has also been categorized.

A distinction is sometimes made between dambos (situated in the headwaters of a catchment, along drainage lines but receiving water and mineral nutrients from upslope) and floodplains (usually found in the lower part of the catchment where deposition of materials is taking place):

- ❖ **Upland dambo, watershed type.** These are broad, shallow, low-lying areas along drainage lines where the groundwater table approaches or reaches the ground surface. The outer parts of the dambo often dry out in the dry season, but the centre is often permanently wet. They occur in gently undulating or rolling country in the headwaters of drainage systems.
- ❖ **Upland dambo, valley type.** These are widespread in the plateau areas and occur in less gently sloping landscapes. They are narrower, with steeper slopes, which often have a convex shape caused by an intrusion of iron. The upper edge of the dambo occurs where the water table, under the adjacent interfluvies, is forced to the surface by an impermeable layer, which creates a seepage zone on the valley side. The centre of the dambo may be drier than the sides if the seepage from the sides does not reach the centre during the dry season.

- ❖ **Footslope dambo.** These occur at the base of hills or escarpments where they meet level or gently sloping land. They are mainly found where the escarpment meets the lakeshore plain, but also occur around the base of most hilly areas in the country. Runoff from the higher ground accumulates on the dambo causing shallow flooding and waterlogging. As this water is not replenished once the rainy season is over, it tends to dry off quickly in the dry season.
- ❖ **Floodplains.** These occur where the flow in rivers or streams exceeds the capacity of the channel and the excess water finds release by spreading out over the surrounding land. Floodplains also occur wherever streams or rivers flow through gently sloping or flat land. As the flow disperses across the floodplain it slows down and deposits sediments, which results in these areas having deep soils of moderate or high fertility.
- ❖ **Depressions.** These are areas with no visible drainage lines or outlet, so that any surface water is stagnant. In the dry season, surface water evaporates and the water level gradually falls through evaporation and vertical seepage.

It is not clear how and when this classification was arrived at, nor are there indications of whether it is officially recognized.

Mozambique:

Very little work has been carried out in order to characterize, classify, and determine the extension of land covered by the different wetland categories. A tentative exercise was performed by INIA (2001), in order to access the geographical distribution and extension of wetlands in the country, particularly those that are important for agricultural development. This exercise was essentially based on the knowledge of the soil resources, and consisted of using the data contained in the soil data bank at the Land and Water Department at INIA. From the national soil map of Mozambique at 1:1,000,000 scale, its legend (INIA, 1995) and its associated soil attributes database – SDB-M (Frenkel, 1995), and by using the GIS facilities available (ILWIS, v 2.1), dominant soil units associated to certain land forms and matching the wetland systems as described by Chabwela (1991), Hughes and Hughes (1992) and Breen *et al.* (1997), were selected. Different criteria were used to match the wetland systems. These criteria were the land form, flooding occurrence, soil groups and provincial boundaries. The exercise did not cover the marine system.

Areas covered by each group of soils were estimated using the GIS facilities, and the extension of each wetland system and its potential land use or land cover was determined. The palustrine system is mainly used for small scale agriculture, with rice being the dominant crop during the hot, rainy season when the soils are likely to be saturated or inundated. Vegetables, sweet potato, beans and maize are mainly cultivated during the cold, dry season as the flood waters recedes. It can be seen that the estuarine and riverine systems are mostly concentrated in the centre of Mozambique and are mainly composed of the alluvial flood plain and the delta of the Zambezi river. The palustrine system is very important in the south, and the lacustrine system is well represented in the north of the country.

An important part of this system are the “machongos”; these have been described in the country report on wetlands for agriculture development (Gomes *et al.*, 1998). The north of the country also presents a considerable palustrine system (5 870 km² or about 600 000 ha), mostly comprising different land-forms of dambo, common features of headwaters of streams and drainage lines, mostly of upland, high rainfall areas, and also extremely important for small-scale dry season agriculture. Unfortunately dambos have not been so well studied as the “machongos” in the south, partly due to the fact that the “machongos” occur in water deficit areas playing an important role to relieve drought conditions and calling out for more detailed studies.

Table 7
Characterization, classification and inventory activities undertaken in Mozambique

Activity/support	Author/Report - location	Objective	Outcome
Characterization FAO-SAFR	<ul style="list-style-type: none"> Gomes, F., Mafalacusser, J., Marques, M.R., and Brito, R. (1998). Wetlands for Agriculture Development, Mozambique country report South of Mozambique (South of Save River). 	Assess occurrence and distribution of hydromorphic sandy soils and peat soils (<i>machongos</i>) in Southern Mozambique	<ul style="list-style-type: none"> Not given
Inventory	<ul style="list-style-type: none"> Breen, C.M.; Quinn, N.W., and Mander, J.J. (eds), (1997) Wetlands Conservation and Management in Southern Africa: Challenges and opportunities. Summary of the SADC Wetlands Conservation Survey Reports. IUCN Economic value of the Zambezi Basin Wetlands. Zambesi Basin Wetlands Conservation and Resource Utilization Project. IUCN ROSA 	To establish inventory of wetlands systems, attributes and uses in different countries of the SADC region, including Mozambique	<ul style="list-style-type: none"> Inventory of wetlands, attributes and uses established
Inventory	<ul style="list-style-type: none"> CENACARTA (1999). Land use/Land cover map Cenecarta – Dinageca 	An inventory and mapping of the areas of actual land use and land cover for all the country at scale 1: 250,000. Wetlands are also covered by this cartography	<ul style="list-style-type: none"> Inventory and maps of wetland land use
Characterization and inventory	<ul style="list-style-type: none"> Chabwela, H.N. (1991) Wetlands. A Conservation Program for Southern Africa – Mozambique. A report document, Vol III. SADC/IUCN. Preliminary report 	<p>To study the significant diversity of the wetlands system in Mozambique, identify wetland systems (marine, estuarine, riverine, palustrine and the interior lakes), assess wetland functions, products and attributes, and existing institutional framework and legislation</p> <p>To develop a map illustrating the geographical distribution of the main wetland systems in Mozambique (appr. scale: 1:8 000 000)</p>	<ul style="list-style-type: none"> Highlights diversity Wetland types identified Functions, products attributes identified Wetland distribution map developed
Characterization	<ul style="list-style-type: none"> Chenje, M. <i>et al.</i> (Ed) (2000). A directory of African Wetlands. Mozambique. IUCN Chapter 3 (42-74) IUCN Representative Library, Maputo 	To describe the main wetlands of the whole Zambezi Basin, extension, volume of water, utilisation and the impacts of utilisation	Distribution and extent of water, utilization and impacts of wetland utilization established

Activity/support	Author/Report - location	Objective	Outcome
Inventory	<ul style="list-style-type: none"> Hughes R.H., and Hughes J.S. (1992). A directory of African Wetlands. Mozambique. IUCN > IUCN Representative Library, Maputo 	To develop a directory of African Wetlands. Mozambique. IUCN	Directory of wetlands
Classification (soils)	<ul style="list-style-type: none"> INIA-DTA (1993). Os solos das Provincias de Maputo e Gaza > INIA-DTA library 	To collate a set of maps of all the major soil types covering the provinces of Maputo and Gaza contained in several studies. Scales 1:250,000 and 1: 50,000. Reference to hydromorphic soils (classification FAO/UNESCO and mapping)	Soil maps with detail on hydromorphic soils
Inventory	<ul style="list-style-type: none"> INIA-DTA (1997). Southern Mozambique. In: Wetland for Agricultural Development – Mozambique Country Report. Proceedings of an FAO Sub-Regional Conference on Wetland Characterization and Classification for Sustainable Development, Harare, Zimbabwe, 3-6 December 1997 > INIA-DTA Library, FAO Representative in Maputo 	Study the occurrence, distribution and extension of machongos over Southern Mozambique. Scale: 1:4 000 000	Report on occurrence, distribution and extension
Inventory	<ul style="list-style-type: none"> Mafalacasser, J. and Vilanculos, M. (2001). Geographical Distribution of Wetlands in Mozambique – Northern, Central and Southern Regions > INIA-DTA library 	A first attempt to map the distribution of wetlands at national level taking into account the land-forms, main soil groups that match the different wetland system defined by Chabwela, (1991) and Breen <i>et al.</i> (1997). Based on the information stored at the INIA's soil database. Approx. scale: 1:5 660 000	Maps of wetland distribution at national level
Inventory	<ul style="list-style-type: none"> Timberlake, J.R. (2000) Biodiversity of the Zambezi Basin Wetlands. Vols. I, II, III, and IV – Main Report. Consultancy report prepared for IUCN ROSA. Biodiversity Foundation for Africa, Bulawayo/The Zambezi Society, Harare > MADER – DNFFB, IUCN Representation in Mozambique 	To assess the composition and importance of wetland biodiversity in the Zambezi Basin Wetlands, covering four project sites: the Barotse flood plains in western Zambia, the floodplains and swamps of the Chobe/East Caprivi region of Namibia and Botswana, the wetlands of the lower Shire in northern Malawi and Mozambique, and the Zambezi Delta in Mozambique	Composition and biodiversity of wetlands assessed
Characterization	<ul style="list-style-type: none"> Turpie, J., Smith, B., Emerton, L. and Barnes, J. (1999). Economic value of the Zambezi Basin Wetlands. Zambesi Basin Wetlands Conservation and Resource Utilization Project IUCN ROSA > IUCN Representative in Mozambique 	To assess and quantify the economic value of wetland goods and services in four Zambezi Basin Wetland project sites (the lower Shire and the Delta in Mozambique), the existing desincentives, their sustainable use, and recommendations for their future management. Consideration is taken of the use of wetlands for agriculture production	Economic value of wetlands estimated Recommendations for future use identified

Reports on some work done that may have relevance, chiefly indicated by the titles, to the inventories and classification of wetlands in Mozambique are listed in Table 7. These are selected from the larger list of inventories and characterization exercises that were conducted in Mozambique. Eleven out of the twenty-two inventories/characterization activities undertaken in Mozambique appear to have some relevance to wetlands with potential for agricultural purposes. The Mozambique report did not provide any details beyond this.

South Africa:

For South Africa it is reported that there is a lot of site-specific information in the field of wetland inventories and characterization that has not been collated and synthesized. The principal recommendation for southern Africa provided by Taylor *et al.* (1995) is that: “more coordinated effort be put into the collation of information that is already available, for there is a wealth of site-specific reports on wetland sites across southern Africa, but, with some notable exceptions, very little attempt to integrate this in order to provide countries with a baseline product suitable for strategic planning. This lack is especially evident in Lesotho and South Africa, which is surprising given their well developed scientific base”. Since then, little consolidation has been undertaken in South Africa, with the exception of KwaZulu-Natal where a consolidation of all available wetland inventory information was consolidated for the purposes of a broad Strategic Environmental Assessment for the province (Goodman, 2000).

Recognizing the ecological, social and economic importance of wetlands, as well as their highly-threatened status in South Africa, the Department of Environmental Affairs and Tourism (DEAT) initiated a project to compile a national wetland inventory. Such an inventory is considered vital for the effective conservation and management of these important ecosystems.

The inventory gained momentum following a national workshop in November 1997, during which stakeholders plotted a way forward for the inventory process. As determined in the workshop, a catalogue of inventories was compiled as one of the preliminary products - an inventory of inventories undertaken in preparation for a detailed national wetland survey. The list of 89 datasets reported (national consultant report) is, nevertheless, considered incomplete but provides a good picture of most of the inventories undertaken in the country. From the catalogue, it is clear that the different inventories vary greatly from the type of information gathered, and its level of accuracy and detail. For the purposes of this report only those inventories considered relevant to wetlands with potential for agricultural purposes have been extracted from the main catalogue and listed in Table 8.

From the total of 89 activities in inventories and characterizations reported in the country papers, 28 have been identified as having relevance to the development of wetlands for agricultural purposes.

Swaziland:

A total of five inventory/characterization activities are reported to have been undertaken in Swaziland since 1979 (Table 9). Swaziland has riverine, lacustrine, and palustrine systems of wetland, with the riverine system as the commonest type (Breen *et al.* 1997). The riverine wetlands, which are well developed in the lower Middleveld and Lowveld regions, consist mainly of small flood plains and swamps that occur along rivers and streams. Although these wetlands are generally small in size, they provide important grazing resources, water supply, and raw materials for handcrafts and cultural ceremonies, and they are utilized for dry season cropping.

The vleis are well developed in the Highveld, Middleveld and Lubombo regions. These ‘montane’ wetlands have characteristics of swamps, due to the high rainfall and constant flow of water from seepage (Breen *et al.* 1997).

Table 8
Characterization, classification and inventory activities undertaken in South Africa

Activity/support	Method/Author/Citation	Objective	Outcome
Inventory	<ul style="list-style-type: none"> Department of Environmental Affairs and Tourism (DEAT). Coordinated by South African Wetlands Conservation Programme (1997) 	To compile a national wetland inventory	<ul style="list-style-type: none"> Catalogue of previous inventories compiled as preparation for wetland survey
Characterization	<ul style="list-style-type: none"> CONDOR database Begg, G.W. (1988) The Wetlands of Natal (Part 2): The distribution, extent and status of wetlands in the Mfolozi catchment Natal Town and Regional Planning Report No. 71 	To describe physical, ecological and hydrological characteristics for significant (palustrine) wetland sites only in KwaZulu-Natal	<ul style="list-style-type: none"> Report on measured parameters of 996 wetlands
Characterization	<ul style="list-style-type: none"> Begg, G.W. (1989). The Wetlands of Natal (Part 3): The location, status and function of the priority wetlands of Natal 	To describe physical, ecological and hydrological characteristics for each priority (palustrine, lacustrine) wetland site in KwaZulu-Natal; utilization, references, land ownership	<ul style="list-style-type: none"> Report on measured parameters of 24 priority wetlands (with regard to management and policy formulation wetlands)
Inventory	<ul style="list-style-type: none"> Burgis, M.J., Symoens, J.J. (eds) (1987). African wetlands and shallow water bodies: Directory 	To describe detailed physical, chemical, hydrological, ecological features of estuarine, palustrine, lacustrine, riverine wetlands in North-West Province, KwaZulu-Natal, Western Cape	<ul style="list-style-type: none"> Report on measured parameters on Barberspan, Kosi Lakes, Pongolo floodplain, St Lucia system, Wilderness Lakes Botriviersvlei, De Hoop Vlei, Sandvlei
Inventory	<ul style="list-style-type: none"> Compaan, P.C. (1992) Preliminary list of vleis and pans in the Transvaal Transvaal Provincial Administration Chief Directorate of Nature and Environmental Conservation 	Listing wetland name and farm names in Gauteng, Northern Province, North-West Province and Mpumalanga	<ul style="list-style-type: none"> List of 217 wetland names and farms where they occur
Inventory	<ul style="list-style-type: none"> Breen, C.M., Heeg, J., Seaman, M. (1993) Wetlands of the World I: Inventory, Ecology and Management 	List of riverine, palustrine, lacustrine in Northern Province, Mpumalanga, KwaZulu-Natal, Eastern Cape, Western Cape, Free State, North-West Province	<ul style="list-style-type: none"> Detailed description of some systems, summary of main features for others

Activity/support	Method/Author/Citation	Objective	Outcome
Inventory & characterization	<ul style="list-style-type: none"> Cowan, G.I. (1995). South Africa and the RAMSAR Convention in Wetlands of South Africa 	To identify and describe physical, ecological and hydrological characteristics of the Ramsar wetland (marine, estuarine, lacustrine, palustrine, riverine) sites	<ul style="list-style-type: none"> Descriptions of these sites
Characterization	<ul style="list-style-type: none"> Cowling, R.M. (1991). A preliminary report on the flora and vegetation of the Wildevoelvlei flats in the Noordhoek/Kommetjie basin. <ul style="list-style-type: none"> Botanical Society of South Africa 	To list plant species for all wetlands together in Wildevoelvlei flats, Cape Peninsula	<ul style="list-style-type: none"> Published list of species
Inventory	<ul style="list-style-type: none"> Dely, J.L., Kotze, D.C., Quinn, N.W. & Mander, J.J. (1995) A pilot project to compile an inventory and classification of wetlands in the Natal Drakensberg Park. Institute of Natural Resources Investigational Report No. 101 	To compile brief ecological and hydrological summary, plant species lists, detailed physical attributes on 63 wetlands in KwaZulu-Natal	<ul style="list-style-type: none"> List of wetland plant species
Inventory	<ul style="list-style-type: none"> Department of Environmental Affairs and Tourism – Wetlands Conservation Programme National wetland information database GIS-generated, point data only, ArchInfo 	To compile name, degree of protection, managing authority, conservation value, species lists, contact details of (marine, estuarine, palustrine, lacustrine, riverine) wetlands in Northern Province, Mpumalanga, KwaZulu-Natal, Eastern Cape, Western Cape, Free State, North-West Province, Gauteng, Northern Cape	<ul style="list-style-type: none"> Database on 840 wetlands
Characterization	<ul style="list-style-type: none"> Heeg, J., Breen, C.M. (1979). The Pongolo floodplain: its functioning and role in the development of the Makatini Flats Secretary for Cooperation and Development (unpublished) 	To describe physical, ecological and hydrological details for floodplain (palustrine wetlands) in KwaZulu-Natal, but not for individual pans	<ul style="list-style-type: none"> Descriptions of physical, ecological and hydrological details on 37 wetlands
Inventory	<ul style="list-style-type: none"> Hughes, R.H. & Hughes, J.S. (1992) A Directory of African Wetlands <ul style="list-style-type: none"> IUCN, Gland and Cambridge/UNEP, Nairobi/WCMC, Cambridge 	Description of physical, ecological and hydrological details for 15 wetland (estuarine, lacustrine, palustrine, riverine) sites in Eastern Cape, Gauteng, KwaZulu-Natal, Mpumalanga, Northern Cape, Northern Province, North-West Province, Free State, Western Cape	<ul style="list-style-type: none"> Descriptions of physical, ecological and hydrological details on 63 wetland sites
Inventory	<ul style="list-style-type: none"> Lindley, D. Rennies Wetlands Project wetland surveys 	To assess hydrological zones, plant species, exotic species, erosion, ownership of palustrine wetlands in Gauteng, KwaZulu-Natal, Eastern Cape, Western Cape, Free State, Mpumalanga, Northern Province	<ul style="list-style-type: none"> Descriptions of physical, ecological and hydrological details on wetland sites

Activity/support	Method/Author/Citation	Objective	Outcome
Inventory	<ul style="list-style-type: none"> Noble, R.G. & Hemens, J. (1978). Inland water ecosystems in South Africa - a review of research needs South African National Scientific Programmes Report No. 34. CSIR 	General summary only on palustrine, riverine wetlands in all 9 provinces	<ul style="list-style-type: none"> Research needs on major vleis and floodplains in South Africa
Inventory	<ul style="list-style-type: none"> Rogers, K.H. (1995) Riparian wetlands ➢ In Wetlands of South Africa 	37 major palustrine, riverine wetlands types described in Gauteng, KwaZulu/Natal, Northern Cape, North-West Province, Free State, Western Cape, Mpumalanga, Northern Province	<ul style="list-style-type: none"> Not specified
Characterization	<ul style="list-style-type: none"> Seaman, M.T., Kok, D.J., Phillips, E. (1991-94) OFS wetland inventory - tertiary catchment C13, 14-19 (OFS portion) inclusive ➢ Orange Free State Directorate of Nature Conservation (6 unpublished reports) 	Collate ecological, physical and hydrological details for some palustrine wetland sites of "significant size to warrant inventory", land ownership and altitude for all sites in Free State Province	<ul style="list-style-type: none"> Mapped wetland boundaries Catchment name, size, land use, quaternary catchment number
Inventory	<ul style="list-style-type: none"> Silberbauer, M.J., King, J.M. (1991) The distribution of wetlands in the south-western Cape Province, South Africa 	To mark wetlands on 1:50000 aps as "marsh symbols on a drainage line" in South-Western Cape	<ul style="list-style-type: none"> 17300 wetlands (estuarine, palustrine, lacustrine, riverine) marked
Characterization (water quality)	<ul style="list-style-type: none"> Silberbauer, M.J., King, J.M. (1991). Geographical trends in the water chemistry of wetlands in the south-western Cape Province, South Africa South African Journal of Aquatic Science 17(1/2): 82-88 	To measure and locate on general maps salinity, conductivity, pH, TDS on 73 wetlands (estuarine, palustrine, lacustrine, riverine) in the South-Western Cape	<ul style="list-style-type: none"> Maps with measured features located
Characterization	<ul style="list-style-type: none"> Tarboiton, W. Transvaal Bushveld Wetland Survey ➢ Transvaal Provincial Administration Nature Conservation Division. Project TN 6/4/2/3/2 	To assess conservation status and biological significance of the floodplain systems in Northern Province, Gauteng, North-West Province	<ul style="list-style-type: none"> Conservation status and biological significance assessed
Inventory	<ul style="list-style-type: none"> Schwabe, C.A., Whyte, C.R. (1919) Human Sciences Research Council email: envimap@iafrica.com (unpublished) 	An investigation into the distribution of wetlands and grasslands and their carrying capacities within the Mokhotlong District of Lesotho and Eastern Maloti Highlands	<ul style="list-style-type: none"> 1000 wetlands (lacustrine and riverine) mapped 973 wetlands mapped

Activity/support	Method/Author/Citation	Objective	Outcome
Inventory	<ul style="list-style-type: none"> Whyte, C.A., Sheperd, J.K. (1996) An inventory of the wetlands in the Mkomazi catchment of KwaZulu-Natal GIS and Arc/Info or ArcView 	3 categories for inventory: 1) dams in wetlands geomorphic sites, 2) wetlands in moderate to good condition and 3) wetland areas which have been highly disturbed by drainage and cultivation	<ul style="list-style-type: none"> 1934, ranging in size from 0.013ha to 64.33 ha mapped
Characterization	<ul style="list-style-type: none"> Linström, Anton Mpumalanga Parks Board Wetland Surveys Arc/Info 	Assess hydrological zones, plant species, exotic species, erosion, ownership	<ul style="list-style-type: none"> Land use, etc. Reports on each wetland Detailed description of utilization and impacts
Inventory	<ul style="list-style-type: none"> Cowan, G.I., van Riet, W. (1998) A Directory of South African Wetlands Department of Environmental Affairs and Tourism 	Location of palustrine, lacustrine, riverine, estuarine, marine, man made wetlands in all provinces	<ul style="list-style-type: none">
Characterization	<ul style="list-style-type: none"> Jones, G. (2001) Development of a wetland classification for the "ecological reserve" in the Western Cape – unpublished gjoness@botzoo.uct.ac.za 	Assessment of wetlands (endorheic, palustrine, riverine, estuarine) that were unimpacted as much as possible in Western Cape	<ul style="list-style-type: none"> GPS point data and an estimate of the size
Inventory	<ul style="list-style-type: none"> Illgner, P., Rowntree, K. (2001) Eastern Cape Wetland Inventory 	Eastern Cape Wetland Inventory (palustrine, lacustrine, riverine, estuarine)	<ul style="list-style-type: none"> Current
Characterization	<ul style="list-style-type: none"> Marneweck, G., Grundling, P.-L., Grundling, A.T. (1996) Wetlands in the area of the Jorodane, Bokong and Senqunyane rivers in the Likalaneng region of Lesotho 	A description of the wetlands; identification of current and potential threats; and a discussion on their conservation importance, management and restoration in Mpumalanga, Northern Province	<ul style="list-style-type: none"> Wetlands assessed
Characterization	<ul style="list-style-type: none"> Marneweck, G., Grundling, P.-L., Grundling, A.T. (1999) An environmental plan for the protection, maintenance, and wise-use of wetlands on the Steenkampsberg plateau wetland@smartnet.co.za 	To develop management plan of wetlands in the province of Lesotho	<ul style="list-style-type: none"> Current 22 wetlands assessed
Characterization /inventory	<ul style="list-style-type: none"> Marneweck, G.C., Batchelor, A.L. WRC report in progress The classification, distribution and delineation of different wetland types in the catchment area of the upper Olifants and Klein Olifants Rivers (provisional title) 		

Table 9
Characterization, classification and inventory activities undertaken in Swaziland

Activity/support	Method/Author/Citation	Objective	Outcome
Inventory/ characterization	<ul style="list-style-type: none"> • Anonymous (1979) • Survey on nationally protection-worthy areas 	To identify, map, characterize, and recommend for protection the protection-worthy wetlands of Swaziland	<ul style="list-style-type: none"> • All those listed as 'proposed for protection' in 1979 have been protected • Some were characterized and described
Inventory	<ul style="list-style-type: none"> • Rogue and Dobson (in preparation) 	Wetland identification in Cibidze, Gege, Lushikishini and Motjane in the Highveld region, Tondozi in the Middleveld region, and Balekazulu and Wesselrode in the Lowveld region.	<ul style="list-style-type: none"> • 'Identified marshes' mapped and presented • These lie outside the current protected areas
Inventory	<ul style="list-style-type: none"> • IUCN (Breen <i>et al.</i> 1997) • 	Review of the major riverine and palustrine wetlands found in some of the protected watersheds	<ul style="list-style-type: none"> • Locations of the major wetlands • areas of the watersheds in which the wetlands are found
Characterization	<ul style="list-style-type: none"> • GOS (1998) (SPFS) 	Assessing constraints to smallholder irrigation development in Swaziland	<ul style="list-style-type: none"> • Lack of appropriate technologies major constraint
Inventory/ characterization	<ul style="list-style-type: none"> • SADC wetland project (1991) 	Mapping wetlands from biological, ecological, socio-economical and land use point of view; developing regional policy and action programmes for conservation and multiple uses of wetlands	<ul style="list-style-type: none"> • Phase I completed and is in Phase II of project

A recent survey reported that lack of appropriate technologies for utilizing wetlands is one of the main factors constraining smallholder irrigation development in Swaziland (GOS, 1998). In the 1991/92 cropping season, it was estimated that out of the 90 000 ha of potentially irrigable land, only 50 percent was cropped area under irrigation (GOS, 1993). Some of the methods used by communities to exploit the wetland resources are reported as not being sustainable.

The country is endowed with different types of wetlands that have various natural and socio-economic functions and values, which can be enhanced if they are developed and managed properly. The potential of utilizing some of the wetlands for sustainable agricultural production can be realized once all the wetlands are mapped and their hydro-ecological processes fully understood.

Tanzania:

Although Tanzania is rich in wetland resources, ranging from substantial lake systems to river floodplains and deltaic mangrove formations, there have been very few efforts towards developing a wetlands programme. NEMC tried to establish a list of the natural wetlands and their distribution, during 1989, in collaboration with the WWF and IUCN (Table 10).

Table 10

Characterization, classification and inventory activities undertaken in Tanzania

Activity/support	Method/Author/Citation	Objective	Outcome
Inventory	• WWF, IUCN and NEMC (1989)	To develop a wetland conservation and management programme	• Comprehensive report • List of wetlands
Inventory	• SADCC Wetlands Conservation Project (1991) • Matiza and Chibwela (1992)	To formulate national wetlands programme –Initiated National Seminar on the Wetlands of Tanzania to examine the issues and develop proposals for the structure of a national wetlands programme	• The proceedings and findings
Inventory & Characterization	• Wetlands of Tanzania Kamukala, G.L. and Crafter, S.A. (1993)	To categorize the natural wetlands (RAMSAR Convention)	• Three categories established (coastal, rift and riverine wetlands)
Inventory	• Forest Management Project (1997) • Forest Resources Management Project, Final Report Vol.I	National reconnaissance on land use and natural resources mapping project	• Wetlands and their areas per district • 64 maps covering the whole country
Characterization	• United Kingdom M/S Hunting Technical Services Limited (1997). Land use and natural resource reconnaissance level project	Collecting the information on wetlands potential in the country	• 9 091 162 hectares established as total national wetland area

The aim of collecting information by United Kingdom M/S Hunting Technical Services Limited, a consulting firm, on the existing wetlands for conservation and management on the available hectareage on swamps/marshes (permanent), inland water, ocean (coastal strip) and the open grassland seasonally inundated, was to give an idea on the wetlands potential in the country. The final figure of 9 091 162 hectares has been established through this study.

Despite the inventory exercises done by WWF, IUCN and NEMC (1989), the SADC Wetlands Conservation Project (1991), Kamukala and Crafter (1993), Forest Management Project (1997), it is still not known how much of the total area of wetlands available could be utilized for agricultural production, wildlife and forest conservation. Hence there is a need to draw up a programme for detailed wetlands inventory.

Of the inventory and characterization activities undertaken in Tanzania and presented in the country paper, five were identified as being pertinent to wetland development for agricultural purposes (Table 10).

Zambia:

Several attempts were undertaken to carry out inventories and classification of dambo (Mukanda, 1998; Kalapula, 1986). Five of these have been isolated as being relevant to wetland development for agriculture (Table 11). The classifications reported considered soil, hydrology, morphology and climate only. The wetlands of Zambia can be identified through a combination of three factors, which include: mode of formation, physiographic position and moisture regime.

Table 11
Characterization, classification and inventory activities undertaken in Zambia

Activity/support	Method/Author/Citation	Objective	Outcome
Inventory	• Chabwela (1994)	Identify wetland types in Zambia	• Riverine, lacustrine and palustrine wetland systems identified
Inventory	•	Identifying RAMSAR sites in Zambia	• The two sites in Kafue Flats (Lochnivar and Blue Lagoon National Parks) and Bangweulu Swamps (Chikuni)
Characterization	• Dugan (1990)	Identify functions of dambos in Zambia	• Groundwater recharge • Groundwater discharge • Flood control • Water quality • Water transport • Recreation/Tourism
Characterization	• Verboom, after Mukanda (1991)	Classification based on acidity	• Sweet, intermediate and sour dambos.
Characterization	•	Main wetlands are distinguished on the basis of hydrological conditions	• Hydromorphic or phreatic wetland • Fluxial wetland

Verboom (1991, after Mukanda) proposed the classification of dambos based on their acidity. Three classes have been proposed and these include sweet, intermediate and sour dambos (Table 11). Sweet dambos are formed mainly on basic parental material and recent alluvium and have a pH slightly higher than 7.0. These dambos are mainly confined to the wetter parts of the country, in the Northern, Northwestern and parts of the Western and Copperbelt provinces, and coincide with basic parent materials. Intermediate dambos have soils development from mixed sediments with a pH between 5.5 and 6.6. Sour dambos are developed from sandy and peaty soils derived from more acidic parent material and old alluvium. Soil pH in these dambos is below 5.5 and they are common in the northern half of the country. In the southern part of the country, they also occur over the granites and basement complex rocks.

In general, two main wetland types are distinguished on the basis of hydrological conditions, namely: hydromorphic or phreatic wetland, which mainly receives water by groundwater as well as precipitation, and fluxial wetland, which mainly receives water by surface water, runoff, streams, etc.

The drainage of water in a dambo is also of great significance to dambo classification. Most dambos have an outlet, but a few isolated dambos or pans, especially in the Western Province, have no proper outlet.

Flooding is also an important aspect in classifying dambos. Factors to be considered include depth, speed of flow, rate of rise, duration and period of flooding. Where there is no flooding, the groundwater level is important, especially its fluctuating range. The more stable the groundwater the easier it is to make a wetland productive. No reference was reported in respect to this type of classification. The dambos of Luapula province have been morphologically classified as follows:

- ❖ Upland dambos, found on the main plateaux
- ❖ Valley dambos, being dambos occurring in major valleys
- ❖ Hanging dambos, found only in Luapula province and confined to the high plateau of Luapula province
- ❖ Flush dambos, mainly confined to relatively hilly areas
- ❖ Sand dune dambos, which are unique to the shore of Lake Bangweulu and its associated lagoons

In the Kalahari sands area, pan dambos are also unique to Western Province and are usually circular in nature. Wet dambos are characterized by concave linear depressions and their width varies from 500 to 5 000 m, especially in Luapula province (Mukanda, 1998).

Temperature and radiation are critical climatic factors, though in most cases they are related to altitude aspects of the dambo. Frost, as an extreme condition, is just as undesirable as temperatures over 35°C during certain crop growth stages. The temperature of dambos is critical to classification for agricultural use.

There are no legal prohibitions on the use of dambos in Zambia and thus the conservation of dambo environment has not been critical. This could be due to the relative abundance of fertile land and low population density (10 persons/km²).

Of the five wetlands systems, three occur in Zambia: riverine, lacustrine and palustrine (Chabwela, 1994). These include dambos, swamps, flood plains, flats and shallow lakes. Dambos are the most widespread wetland type, covering nearly 10 percent of Zambia. Swamps, marsh and flood plains are significant and cover 4 percent of Zambia, of which the most dominant are the Bangweulu swamps (11 000 km²), Zambezi Flood Plain (9 000 km²), Kafue Flats (6 500 km²), Mweru-Luapula (4 500 km²), Chambeshi Flats (3 500 km²), Lukanga Swamp (2 500 km²), Busanga Plain (2 500 km²) and Mweru-Wantipa (1 300 km²).

Zimbabwe:

Since 1980, nine identifiable attempts have been made to compile inventories and characteristics of wetlands in Zimbabwe. These have been done at the national level and on a local, individual scale. The most notable attempt in Zimbabwe to compile an inventory of “wetlands” at national level was carried out by Whitlow (1984a), who mapped out the country’s dambos using 1:80 000 scale aerial photographs. He calculated that dambos in Zimbabwe cover an area of 1.28 million ha, which is 3.6 percent of the country’s total land area. He also estimated that over 1 000 000 ha occur in commercial farming areas while the remaining 260 000 ha are in communal lands.

Whitlow found that dambos are primarily located on the gently undulating highveld plateau, which is above 1 200 m above mean sea level. The areal extent of each dambo ranges from 0.1 to 1.0 km in width and 0.5 to 5.0 km in length (Bell *et al.* 1987). He reported that the distribution of dambos is influenced by factors such as relative relief, bedrock characteristics, and climatic conditions. Low relief and the gentler river gradients that dominate the central watershed favoured the formation of dambos. Dissected terrain and incised rivers resulted in the formation of localized dambos. Eighty percent of dambos occur in areas with gently sloping terrain, whose average slope was less than 4°. More localized dambos occur in areas with an average slope that exceeds 4°. Dambos were also observed to occur on granitic rocks. Whitlow (1984a) used class, average slope classes, and rock types to describe the distribution of dambos in Zimbabwe.

Three types of dambos were identified in Zimbabwe, being (Acres *et al.* 1985; Bell *et al.* 1987):

- ❖ Headwater dambos that are channels, broad and sometimes coalescing
- ❖ Stream dambos that are adjacent to second and third order stream channels
- ❖ Residual dambos that are narrow and linear and occurring along first order side streams

It is acknowledged that significant variations occur amongst dambos as well as within individual dambos. Those individuals working with specific dambos have carried out detailed characterizations of their respective dambos of interest Table 12. While Whitlow's (1984) dambo characterization tends to be more generalized, given the national scale level he was dealing with, his results are more guidelines as to the nature of dambos one can expect in given areas, hence the natural and land use inventory. Work by Bell *et al.* (1987 and 1991), ENDA-Zimbabwe (2001), as well as by DR&SS (1980 to present), confirms that detailed inventory assessments of dambos are a must, as variations among and within dambos are inherent to these natural features.

7.2.3. Summary

It is obvious that all the eight countries in the SADC region have wetlands within their boundaries and that all have carried out some assessment activities on these ecosystems. Whilst most of this work contributes to inventory and characterization of the wetlands, both at national and regional levels, there is much variation in the depth and focus at which such activities were nationally performed.

The number of wetland inventory/characterization activities, pertinent to the use of wetlands for agriculture, conducted in the different countries within SADC is shown in Table 13 below.

Table 13
Number of inventory/characterization initiatives in SADC countries

Country	Number of wetland assessment initiatives		
	Inventory	Characterization	Total
Lesotho	1	4	5
Malawi	2	2	4
Mozambique	6	5	11
South Africa	16	12	28
Swaziland	3	2	5
Tanzania	2	4	6
Zambia	2	3	5
Zimbabwe	2	7	9
Total	34	49	83

Table 12
Characterization, classification and inventory activities undertaken in Zimbabwe

Activity/support	Method/Author/Citation	Objective	Outcome
Inventory	• Whitlow (1984)	To map out the country's dambos using 1:80 000 scale aerial photographs	<ul style="list-style-type: none"> • 1.28 million ha, which is 3.6% of the country's total land area • Over one million hectares occur in commercial farming • 260 000 ha are in communal areas
Characterization	• Whitlow (1984)	To describe the distribution of dambos in Zimbabwe using class, average slope classes and rock types	<ul style="list-style-type: none"> • Distribution of dambos influenced by relative relief, bedrock characteristics and climatic conditions • More localized dambos occur in areas with average slope that exceeds 4° • 80% of dambos occurs in areas with gently sloping terrain whose average slope was less than 4°
Characterization	• Whitlow (1984, 1985)	To identify soil types in dambos	<ul style="list-style-type: none"> • Calcic, hydromorphic and non-calcic hydromorphic soils
Characterization	• Acres <i>et al.</i> (1985); • Bell <i>et al.</i> (1987)	To identify types of dambos in Zimbabwe	<ul style="list-style-type: none"> • Headwater dambos • Stream dambos • Residual dambos
Characterization	• Bell <i>et al.</i> (1987)	To determine dambo sizes	<ul style="list-style-type: none"> • Dambo size ranges from 0.1 to 1.0 km in width and 0.5 to 5.0 km in length
Characterization	• Bell <i>et al.</i> (1987) • Bell <i>et al.</i> (1991)	Study on the political economy of soils and water resources	<ul style="list-style-type: none"> • Reported regional variations in the characteristics of dambos in terms of total dambo area, garden area, cultivable dambo, average dambo garden size and soil type (sandvlei and clayvlei) • Pedological variations within and between dambos with transverse sections having dry dambo (upper), marginal dambo. Upper dambo, and lower dambo (bottom)
Characterization	• IUCN (1993)	Study on dambo conservation, rehabilitation and management in the Save Catchment	<ul style="list-style-type: none"> • Characterized dambos on the basis of their ecological status with morphology, soils, vegetation and hydrology as the main variables
Inventory	• Lupankwa (2000) • GIS	To produce inventory of wetlands in Zimbabwe using GIS	<ul style="list-style-type: none"> • In progress
Characterization	• ENDA-Zimbabwe (2001)	Conduct general and detailed characterization of the Matopo (Hills) Wetlands in Matabeleland South	<ul style="list-style-type: none"> • Variation on the transverse in terms of soils, vegetation and fauna from swamp at valley bottom towards the catchment

A total of 83 initiatives, all to develop wetland inventories/characterization for purposes that are applicable to agricultural use of these ecosystems, have since been undertaken in the eight SADC countries, as identified by national consultants of these countries. This listing excludes some initiatives that appeared to have little to do with wetlands and any such initiatives in the other six SADC countries, such as Botswana, Namibia, Angola and the DRC. Of this total, 34 would fall under the category of inventories whilst 49 were aimed at characterization of the ecosystems. Amongst these initiatives, there are those in which both activities – inventory and characterization – were undertaken. In many cases, the dividing line between these categories was very faint and hence the total figure of these initiatives has greater importance than the split figures.

Most of these initiatives for developing wetland inventories and characterizing these ecosystems were driven by the need to conserve rather than utilize them for agricultural purposes. However, the outcomes in the form of data of such activities are applicable or adaptable to the focused area of agricultural utilization of these wetlands.

7.3. Conclusions

A number of conclusions were drawn from the information collated from the different countries and these include the following:

- ❖ The major driving force behind the characterization of wetlands and the development of the majority of inventories reported in this document was the concern for environmental protection of these ecosystems
- ❖ The wetlands systems are generally viewed as sensitive areas that should either be left alone or protected from human and animal (livestock) interference. Human interference through cultivation is considered to be the most destructive utilization system in respect to wetlands, and hence it has been discouraged in all SADC countries, with some exceptional variations for Mozambique and Zambia. In Mozambique, wetlands outside protected conservation areas do not carry a “protection” regulation, suggesting they could be put to any use. In Zambia there appears to be no regulation against the cultivation of wetlands. For Malawi, the situation concerning use is not very clear from the national report
- ❖ A substantial number of the initiatives in the region appear to have been supported/triggered by international organizations rather than local administrations. This tends to suggest that either the national government administrations have limited financial capacity to support environmentally-related projects, or that there is a lack of concern/priority and interest in this field
- ❖ South Africa, Mozambique and, to some extent, Zimbabwe and Zambia have had some locally supported initiatives. South Africa, followed by Mozambique, has had a greater number of initiatives than any other country in the region. It would also be observed that South Africa and, at some stage, Zimbabwe are the only countries that evidently promoted cultivation of wetlands under the commercial sector for such crops as maize and sugar-cane. This was, however, not applicable to the smallholder sector, where farmers were actually discouraged from cultivating wetlands
- ❖ The nature of most of these inventories and characterizations is fragmented, a symptom of unsystematic initiatives driven by different and varied site-specific agendas
- ❖ Depth and inclusion of the initiatives in respect to information is very variable, but it is noticeable that the descriptions of vegetation and soils have more detail than hydrology and other physical and socio-economic parameters
- ❖ All of the initiatives have limitations on the inclusion of the human component for the utilization of these ecosystems, except for references to the prohibition of their use. Malawi, Zambia and

Zimbabwe have made some limited effort to address this issue. This is not surprising in a region where the majority of decision-makers are biased towards protection and conservation of a resource with functions they least understand

7.4. Recommendations

The following recommendations can be drawn, based on the observations of the current scenario in the region as a whole:

- ❖ National governments should be encouraged to take up the responsibility for research and development of the wetland systems for purposes of conservation, utilization for agricultural purposes, and sustainable management. The attitude that wetlands are “waste” lands, “no-go” area that are better left untouched, needs to be replaced with a positive approach that focuses on the need for understanding the resource, its processes, rehabilitation, management, and the sustainable utilization of these ecosystems
- ❖ Available national data and information should be collated and analyzed for its usefulness in respect to the establishment of inventories and characteristics of these wetlands for purposes of agricultural development
- ❖ All SADC countries should design and implement systematic and coordinated national/regional wetland inventories and characterization initiatives, particularly focusing on the use of wetlands for agricultural purposes
- ❖ Countries should seek for regional (SADC) coordination and assistance in this field, which would foster the sharing of information, increased efficiency in the use of resources and the standardization of the characterization and inventory systems/methods
- ❖ SADC countries need to evaluate, agree and adopt standard names and definitions of ecosystems with similar characteristics, functions and uses, in order to facilitate the sharing and comparative analysis of information
- ❖ SADC member countries with appropriate capacity in conducting holistic inventories and characterization should be given the opportunity to assist with the design, expertise and equipment in a coordinated regional initiative

Chapter 8

Key paper 3:

Projects and activities; exchange and dissemination of information

The different countries in the region have initiated different projects and activities on wetlands, based on different aims and objectives, as dictated by the national circumstances and focus. To account for the information on these projects and activities, the report has tabulated lists of these projects and activities, indicating whether they are completed or ongoing. These lists also indicate the publications and their sources and location wherever applicable. Training projects are not included in this chapter, but are dealt with in chapter 9.

Brief summaries and reviews of the information on strategies to enhance dissemination are provided in the body of the text, on a country by country basis for only those aspects considered relevant which cannot be contained in the tabulated summaries. At the end of this chapter a summarized comparative assessment is given.

8.1. Previous and ongoing projects and activities and strategies on dissemination of information

Information on the completed and ongoing projects and related activities for agricultural purposes on wetlands in the SADC region is presented in Tables 14-21.

8.1.1. Lesotho

Projects and activities

The Lesotho Highlands Development Authority (LHDA) has undertaken several wetland studies in both Phases 1A and 1B of the Lesotho Highlands Water Project (LHWP), which aims to transfer water from the Lesotho highlands to South Africa. Some rehabilitation activities have since been implemented in Phase 1A, with limited success, in an attempt to restore the wetland at Bokong headwaters that was degraded by road construction. Whilst this project has limited relevance to agriculture, it will have indirect effect through the restoration of hydrological balance in the concerned wetland and below, and also gives lessons in rehabilitation efforts in degraded wetlands, ones which could be applied to those under agricultural uses.

A similar study involving the identification and assessment of wetlands was also undertaken in Phase 1B area of the LHWP, as part of the Baseline Biology and Reserve Development Study. For each wetland the physical and biological attributes were recorded. In addition, the extent of degradation was also assessed for each wetland. The LHDA is extending the project by including annual monitoring of the condition of the wetlands for an initial period of five years (Table 14).

Table 14
Past and ongoing projects and activities related to agriculture on wetlands in Lesotho

Period	Project implementer/yr/supporter	Activities	Relevance to Agriculture	Publication and location
Past	<p>Lesotho Highlands Water Project (LHWP) – Phase 1A</p> <ul style="list-style-type: none"> Marneweck and Grundling (1999) 	<ul style="list-style-type: none"> Studied 28 mires that occur in the upper catchment - providing a baseline assessment of a larger number and diversity of wetlands in order to get a better understanding of their current status identified anthropogenic impacts that are responsible for degradation of wetlands (included agriculture, grazing, roads, etc) 	<ul style="list-style-type: none"> Low medium high 	<p>Marneweck and Grundling (1999). Wetlands of the upper catchment areas of the Bokong, Maliba-Matso and Matsoku Rivers in the Leribe, Mokhotlong and Butha-Buthe Districts. Afridev Consultants and LHDA. Maseru.</p>
Current	<p>Lesotho Highland Water Project as part of the Baseline Biology and Reserve Development Study (Phase 1B)</p> <ul style="list-style-type: none"> Lesotho Highland Development Authority (LHDA) 	<ul style="list-style-type: none"> Identification and assessment of wetlands physical and biological attributes were recorded the extent of degradation was also assessed now annual monitoring of the condition of the wetlands for an initial period of five years 	<ul style="list-style-type: none"> Medium medium medium medium 	<p>Phase 1B area of the LHWP following on work done by Schwabe in Phase 1A in 1992</p>
Current	<p>Developing a five-year plan for the unique alpine ecosystem of Lesotho through the Maloti-Drakensberg Trans frontier Conservation and Development Project</p> <ul style="list-style-type: none"> Ministry of Environment, Gender and Youth Affairs 	<ul style="list-style-type: none"> Assessment of the current status of resources in the area, including wetlands and identification of major threats mapped land-cover database (used the Landsat Thematic Mapper (TM) satellite imagery) mapped spatial distributions of rivers and wetlands mapped main land uses and land tenure mapped generalized land cover classes for agriculture 	<ul style="list-style-type: none"> Medium low medium medium medium 	<p>Marneweck and Grundling (1999) Wetlands of the upper catchment areas of the Bokong, Maliba-Matso and Matsoku Rivers in the Leribe, Mokhotlong and Butha-Buthe Districts. Afridev Consultants and LHDA. Maseru</p>
Past	<p>Wetland Conservation Programme for Southern Africa (1990-1996)</p> <ul style="list-style-type: none"> (SADC) supported by Royal Norwegian Ministry of Development Cooperation (NORAD) through IUCN 	<ul style="list-style-type: none"> Assessment of the situation of wetlands in the sub-region the status of wetlands in terms of their types, condition, and threats in different SADC countries generic regional programme of action for conservation and sustainable use of wetlands 	<ul style="list-style-type: none"> High 	<p>IUCN publication ?</p>
Current	<p>Wetland Conservation Programme for Southern Africa</p> <ul style="list-style-type: none"> (SADC) current support unknown 	<ul style="list-style-type: none"> Phase 2 not clear Current phase activities not known no activities yet 	<ul style="list-style-type: none"> High ?? 	<p>Nil</p>

More recently, in 1999, the Ministry of Environment, Gender and Youth Affairs initiated a study aimed at developing a five-year plan for the unique alpine ecosystem of Lesotho through the Maloti-Drakensberg Transfrontier Conservation and Development Project. The project activities involved *inter alia* the assessment of the current status of resources in the area, including wetlands and identification of major threats. Although it is not clearly stated in the country paper, this project appears to be ongoing (Table 14).

Strategies on information dissemination

The Lesotho country paper presents an impression of a situation where a number of reports and papers have been written on the activities of specific projects and activities, but which have had very limited circulation within the country. Some of the project activities have no reference or location indicated. A substantial number of these documents appear to be either in the institutions that hosted the programmes, consultancy firms, in South Africa, or in international publications. Sharing and publication of this material in national publications was not indicated.

The following would be suggested:

- ❖ distribution of materials in the locally accessible reading outlets and institutions
- ❖ crystallization of major findings and translation into the local languages for the local population to access and use, use of regional publications

8.1.2. Malawi

Projects and activities

The Malawian country paper indicated that “wetland information is not readily available” in the country. Data on specific components of wetland ecosystems and delineation are reported as being either absent or out of date. It is, however, not clear whether this is an indication of the lack of wetland projects, particularly for enhancing, the agricultural use of these ecosystems, or whether the information flow systems are limiting. Of the fourteen wetland-related projects, as shown in Table 15, eleven are not current. This is an observation that might suggest that work on wetlands is currently relatively limited in Malawi. It is also apparent that the greater portion of the work is initiated by international organizations and very little appears to be locally-driven. This could be due to the lack of local resources, expertise, or capacity, as indicated in the country paper.

The country paper presented a list of 22 NGOs that are active in Malawi and two of these, Concern Universal and CURE, were singled out as those that have programmes that focus on environmental issues, including capacity-building for wetland users.

There is, generally, a lack of clear status for wetlands, in particular there is no gazetting nor delineation of important wetland areas. Most of the wetland areas are unprotected, those protected being associated with National Parks and Game Reserves (Ambali and Kabwazi, 1999). This is reported as contributing to the lack of planning at wetland level, where each sector makes its own plans and developments irrespective of the broader needs of the conservation of the wetland.

There is an indication from the report that whilst policies, “old statutes protecting cultivation in dambos and restricting riverbank cultivation”, are in place, there is poor enforcement of these mechanisms. Whilst it is apparent that the official view on wetlands is still largely protective and restrictive of wetland agriculture, indigenous farmers do practice some cultivation but without technical assistance and support. This could be one of the reasons why there has been limited research on agricultural uses of wetlands, and why farmers are still using “work-intensive methods”

and show “a lack of knowledge on appropriate technologies for wetland utilization” as reported. Traditional knowledge on wetland systems is indicated as having broken down and the current uses have not borrowed from it.

The competition between wetland agriculture and other uses, particularly wildlife, was highlighted. This further explains the larger number for conservation projects compared to agricultural ones.

Strategies on information dissemination

Despite the limited amount of information generated on the use of wetlands for agriculture in Malawi, the little that is available does not appear to be shared efficiently.

The following would be suggested to improve information on wetlands in Malawi:

- ❖ Convince/persuade policy makers to support research and development of agriculture on wetlands in Malawi. The research should, in particular, highlight the past and present agricultural practices and activities by indigenous farmers on wetlands and the contribution of such ecosystems to their livelihoods
- ❖ Collate and make available/accessible all the relevant information on wetland agriculture in Malawi
- ❖ Enhance the use of regional publications

8.1.3. Mozambique

Projects and activities

Whilst it is reported that there is no official support for utilizing wetlands for agricultural purposes, some wetland agricultural activities on wetlands exist at community level. Farmers and sympathetic organizations are undertaking several activities, particularly in terms of irrigation development through private funding. Irrigation is closely related to wetlands since most of the irrigation schemes are located along the alluvial flood plains (the riverine system). Farmers are also cultivating wetlands, using traditional systems of constructing ditches that serve as both drainage lines and irrigation water delivery channels in order to create a favourable environment for crop growth (the palustrine system). The country paper could not, however, specify particular projects and areas specifically devoted to the use of wetlands for such agriculture systems.

The National Action Plan, within the FAO’s Special Programme for Food Production in Support to Food Security, has activities in several districts of Maputo province (in the South), and in Sofala and Manica provinces (in the Centre). Among other issues, the project is promoting the use of improved water management practices on existing irrigation schemes, and developing new small-scale irrigation schemes through the introduction of treadle pumps, combined with the use of improved varieties, fertilizers, and pesticides to increase crop production. All the small-scale irrigation schemes promoted by this project are located in the riverine wetland of the Umbeluzi and Tembe rivers in the South, and the Muda river in the centre of the country.

Table 15
Past and ongoing projects and activities related to agriculture on wetlands in Malawi

Period	Project implementer /supporter	Activities	Relevance to Agriculture	Publication and location
Past	• ?? • ?? • FAO (1996)	• Socio-economic and production system study of wetland use - highest population densities are found in the floodplain areas and valley bottoms, and the lowest are in the watershed areas	• High - medium	Main text and working papers 1 and 2. Government of Malawi, Lilongwe
Past	• VAM (1996) • WFP/GoM/USAID supported	• Malawi baseline survey 1996 - poverty occurs mostly in the Northern Lakeshore areas, the Chilwa and Phalombe bottom lands	• Medium - low	A Quest for Causality: Vulnerability assessment and mapping, Malawi baseline survey 1996. WFP/GoM/USAID
Past	• ?? • ?? • FAO and IFAD supported	• Social-Economic and Production System (SEPS) Study of Wetland Use - increasing understanding of the characteristics, needs, and priorities of the communities who have access to wetlands, and how wetland use can be improved	• Medium - high	???
Past	• Mzima • ?? • SADC/IUCN supported	• Wetlands Conservation Programme for Africa - undertaking an inventory of the wetlands of the region, and to gather information for use in formulation of appropriate measures for conservation and sustainable use of the wetlands	• Medium - medium	Chabwela, H.N. 1991. Wetlands: A Conservation Programme for Southern Africa. A Report Document, Vol II. IUCN/ SADC
Past	• ?? • UNDP/FAO supported	• Land Resources Evaluation Project - aimed at appraising, describing, and mapping the physical environment of Malawi	• Medium - low	Land Resources Evaluation Project (project No. DP/MLW/85/011 of 1991)
Past	• Hughes, R.R. and J.S. Hughes	• A Directory of African Wetlands (Draft) - A description of 17 wetlands of Malawi is given	• Medium - low	A Directory of African Wetlands Year???
Past	• Government (Draft) ? • 1999	• National Biodiversity Strategy and Action Plan (Draft 1999) - lists 17 wetlands of Malawi - biodiversity assessment, gaps and constraints	• Medium - low - low	National Biodiversity Strategy and Action Plan (Draft 1999)
Past	• ?? • 1999 ??	• Literature review on the Ichthyofauna of wetlands of Malawi - general features of 11 wetlands in Malawi and their fish diversity	• Low - low	??
	• ??	• Formation of national Steering Committee on Wetlands - 15 members, all from technical departments in the committee	• High - low	nil

Period	Project implementer /supporter	Activities	Relevance to Agriculture	Publication and location
Current	• Concern Universal (NGO)	• Smallholder Floodplains Development Project - Community Mobilisation	• High - high	nil
Past	• Government • 1999	• A study on the protection of terrestrial ecosystems - dambos are not protected - legislation against dambos and river bank cultivation lack enforcement	• High - high - high	GoM 1999-NBSAP Draft
Current	• DANIDA • 1998	• Capacity-building in the environment - handbook of community-level law on environmental issues	• Medium - medium	??
Past	• ?? • 1996	• Study on the level of wetland cultivation - 20% of wetlands cultivated	• High - high	??
Current	• IUCN/NORAD	• The Zambezi basin wetlands conservation and resources utilisation project - the Zambezi basin wetlands conservation and resources utilisation project	• High - high	??

Table 16

Past and ongoing projects and activities related to agriculture on wetlands in Mozambique

Period	Project implementer /supporter	Activities	Relevance to Agriculture	Publication and location
Current	• ?? • Private funding	• Irrigation development on wetland areas - most irrigation schemes are located along the alluvial flood plains	• High - high	Nil
Current	• ?? • Traditional systems • Communities	• Traditional cultivation of lowland areas with high water table and rich organic matter soils • Traditional methods used	• High - high	Nil
Current plan	• National Agricultural Hydraulics Directorate • ?? • African Development Bank (ADB)	• development of irrigated areas in alluvial soils and areas with hydromorphic sandy soils and peat soils - improving agricultural practices - empowerment of farmers - enhanced support services	• Medium - medium - high - high	Project plan Project to start in the next few months
Current	• The National Action Plan • ?? • FAO	• Special Programme for Food Production in Support to Food Security - developing new small-scale irrigation schemes through the introduction of treadle pumps, fertilizers, varieties, etc.	• Medium - medium - medium	Project plan

A research programme of INIA on wetland crop production, being carried out by the Land and Water Department, is aimed at promoting sustainable use of hydromorphic sandy soils and peat soils and avoiding degradation. The specific objectives of this project are reported as being:

- ❖ To identify soil and water management practices, and corrective measures for peat soils and hydromorphic sandy soils
- ❖ To test improved cultural practices to increase crop yields and crop production
- ❖ To recommend technologies and practices based on field results

The following activities are ongoing:

- ❖ Monitoring the physical and chemical soil and water changes in the “machongo” (wetland) of Maguenhane, Province of Gaza, southern Mozambique. The “machongo” of Maguenhane is a smallholder area that, in the past, has been supported by an NGO (MOLISVE), and is presently managed by small farmers for rice (hot, wet season) and vegetable (cold, dry season) production. INIA carried out the pedo-hydrological study of the area in 1996, and is now measuring and quantifying the changes occurred under crop production, in order to produce recommendations based on field results to avoid the degradation of this important wetland system
- ❖ On-farm experiments in the “machongos” of Macia and Maguenhane (varieties and crop management practices, including water management and soil conservation measures) in order to produce recommendations on sustainable agronomic, soil and water management and conservation practices. Planned and executed together with the extension services

Strategies on information dissemination

No specific strategies to improve information generation and dissemination were mentioned in the report. The following would however be proposed:

- ❖ Press for increased government support for wetland research and development. A general shortage of funding and human resources for agriculture research in the country was observed.
- ❖ Experiences and knowledge of the indigenous farmers practicing wetland cultivation would be very useful if collated, evaluated and incorporated into the development of new technologies.

8.1.4. South Africa

Projects and activities

Owing largely to socio-political factors, notably apartheid policies, indigenous farmers in South Africa have, historically, had very limited access to the capital and information required to pursue large-scale development options. This is likely to have contributed to the untransformed and, hence, soundly-functioning state of many wetlands in black-owned rural areas. This contrasts with the white-owned, intensively-farmed areas, where many wetlands have been transformed at a time when the indirect benefits accruing from these systems were afforded low priority in relation to the direct benefits from transformed systems.

In South Africa, other than some investigations undertaken by Kotze (1999), very little research has been undertaken on the small-scale cultivation of wetlands. Thus, very little information is available concerning the effect of different agricultural practices on the structure and functioning of South African wetlands.

Considering the extensive number of publications on agriculture in general in South Africa, there are very few publications containing scientific and technical information regarding the development of

wetlands for agricultural purposes. The only known publications focusing on the development of wetlands for agriculture are that of Hill *et al.* (1981), and Scotney and Wilbey (1983). These are both oriented towards the large-scale mechanized drainage of wetlands, especially for the production of planted pastures. Other publications mostly deal with broader issues of wetland conservation and a range of different uses, but do at least contain some information relating to the agricultural development of wetlands (Table 17).

As part of policy proposals for the wetlands of Natal and KwaZulu, Begg (1990) includes a chapter on the sustainable use of wetlands. The following key recommendations, of relevance to the agricultural development of wetlands, are provided in the policy document:

- ❖ Wetland utilization should meet all requirements of the Conservation of Agricultural Resources Act, No. 43 of 1983. Where necessary, greater attention should be given to enforcement of the Act
- ❖ Agricultural use is planned so as to ensure that at least the minimum water requirements of the wetland are met. This includes the volume, rate, timing, direction and quality of water flow
- ❖ Wetland areas representing important habitats are managed to maintain and enhance their natural values
- ❖ Construction of flow protection works such as levees are discouraged. If built, their construction should be subjected to application of the IEM (Integrated Environmental Management) procedure
- ❖ A review process for wetland alteration based on the IEM procedure advocated by the Council for the Environment (Anon, 1989) must be established. This should be achieved through group consultation among specialists, and economic analysis of both the on-site and off-site consequences of wetland alteration should be undertaken to evaluate all of the implications. Finally, land use decisions should not be made without a thorough survey of the site and analysis of several variables, including slope, erosion hazard, wetness, adjacent land-use, wildlife, climate, etc.
- ❖ Depending on soil type, alterations should be restricted to wetlands with a slope gradient of less than 1.5 percent. Furthermore, should the surface drainage of wetlands be undertaken, plans for re-instatement of the original moisture regime (if known or required) must be provided
- ❖ Where cultivation of wetlands is permitted, provision should be made for protective strips of vegetation to remain along drainage lines. Where possible, ploughing should always be undertaken at right angles to the direction of streamflow

Building on the policy framework of Begg (1990), a prototype system for supporting wetland management decisions, called WETLAND-USE, was developed by Kotze *et al.* (1994). This system provides guidelines for assessing the potential impacts of different agricultural land-use and also includes guidelines for the ongoing management of wetlands for selected land-uses (e.g. planted pastures). The scope of this system was limited to land-uses commonly applied by commercial farmers in the KwaZulu-Natal Midlands. WETLAND-USE was subsequently revised (see Kotze and Breen, 2000) to be applicable to a wider geographical area, and also to include recommendations relating to the cultivation of crops within wetlands. The revised system takes specific account of wetlands within the context of subsistence/small-scale farming. The recommendations provided in WETLAND-USE are, however, geared primarily towards minimizing environmental impacts rather than providing detailed production-orientated guidelines.

Table 17

Past and ongoing projects and activities related to agriculture on wetlands in South Africa

Period	Project implementer /yr/supporter	Activities	Relevance to Agriculture	Publication and location
Past	• Hill <i>et al.</i> 1981 • ??	• Wetland Development: Ridge and Furrow System (Revised edition) - system described	• High - high	Department of Agriculture and Fisheries, Natal Region.
Past	• Scotney and Wilbey 1983	• Wetlands and agriculture - wetland systems for agriculture	• High - high	Journal of the Limnological Society of Southern Africa 9, 134-140
Past	• Begg, G.W. 1990 • ??	• The wetlands of Natal (Part 4) Policy proposals for the wetlands of Natal and KwaZulu - guidelines provided	• Medium - medium	Natal Town and Regional Planning Report 75
Past	• McElligott, G., Schmidt, D., Stranack, E., Tucker, A, Tudor-Owen, R. • 2001	• Standards for conservation and environmental management in the South African sugar industry - standards provided	• Medium	South African Sugar Association Experiment Station, Mount Edgecombe
Past	• Grundling, P-L, and Dada, R. • 1999	• Peatlands of South Africa - guidelines provided	• Low - low	SHARE-NET, Wildlife & Environment Society of South Africa, Howick
Past	• Grundling, P-L, Mazus, H, and Baartman, L. • 1998	• Peat resources in northern KwaZulu-Natal wetlands: Maputoland - guidelines provided	• Low - low	Maputoland. Department of Environmental Affairs and Tourism, Pretoria
Past	• Heinsohn, R.D. • 1991	• The potential for cultivation of incema and other wetland species used for craftwork in Natal/KwaZulu - potential evaluated	• High - high	Department of Development Aid, Pretoria
Past	• Hill P.R, Scotney D.M, And Wilby A F. 1982	• Wetland Development: Ridge and Furrow System (Revised edition) - system described	• High - high	Department of Agriculture and Fisheries, Natal Region.
Past	• Kotze D.C 1994a	• A management plan for Blood River vlei - guidelines provided	• Low - low	In: Breen <i>et al.</i> (1994)
Past	• Kotze D.C. 1994b	• A management plan for Boschhoffsvlei - guidelines provided	• Low - low	In: Breen <i>et al.</i> (1994)

Period	Project implementer /yr/supporter	Activities	Relevance to Agriculture	Publication and location
Past	<ul style="list-style-type: none"> Kotze, D.C. 1997a 	<ul style="list-style-type: none"> Wetlands and people: what values do wetlands have for us and how are these values affected by our land-use activities? guidelines provided 	<ul style="list-style-type: none"> High high 	WETLAND-USE Booklet 1. SHARE-NET, Wildlife and Environment Society of South Africa, Howick
Past	<ul style="list-style-type: none"> Kotze, D.C. and Breen, C.M. 1994 	<ul style="list-style-type: none"> Agricultural land-use impacts on wetland functional values. guidelines provided 	<ul style="list-style-type: none"> High high 	WRC Report No 501/3/94, Water Research Commission, Pretoria
Past	<ul style="list-style-type: none"> Kotze, D.C., Breen, C.M. and Klug, J. R. 1994a 	<ul style="list-style-type: none"> Wetland-Use: A decision support system for managing wetlands system developed (mainly conservation) 	<ul style="list-style-type: none"> Medium medium 	WRC Report No 501/2/94, Water Research Commission, Pretoria
Past	<ul style="list-style-type: none"> Kotze, D.C., Breen, C.M. and Klug, J. R. 1994b 	<ul style="list-style-type: none"> Wetland-Use: wetland management decision support system for the KwaZulu/Natal Midlands system developed (mainly conservation) 	<ul style="list-style-type: none"> Medium medium 	Pretoria : Water Research Commission. (WRC Report No. 501/2/94)
Past	<ul style="list-style-type: none"> Kotze, D.C., Breen, C.M. 2000 	<ul style="list-style-type: none"> WETLAND-USE, a wetland management decision support system for South African freshwater palustrine wetlands system developed (mainly conservation) 	<ul style="list-style-type: none"> Medium medium 	Department of Environmental Affairs and Tourism, Pretoria. Available at http://www.ccwr.ac.za/wetlands
Past	<ul style="list-style-type: none"> Mander, M., Heinsohn, D., & Mander, J. 1996 	<ul style="list-style-type: none"> How to grow Incema grass system developed 	<ul style="list-style-type: none"> High high 	SHARE-NET, Howick
Past	<ul style="list-style-type: none"> Peat Working Group. 2001. 	<ul style="list-style-type: none"> Guidelines for reports on the environmental impacts of peat extraction guidelines provided 	<ul style="list-style-type: none"> Low low 	Second Draft. National Department of Environmental Department of Agriculture, Affairs & Tourism, Department of Water Affairs & Forestry
Past	<ul style="list-style-type: none"> Scotney, D.M. 1970 	<ul style="list-style-type: none"> Soil and land-use planning in the Howick extension area. ?? 	<ul style="list-style-type: none"> Low low 	Ph.D. thesis, University of Natal, Pietermaritzburg Unpublished
Past	<ul style="list-style-type: none"> Tainton, N.M. 2000 	<ul style="list-style-type: none"> Pasture management in South Africa ?? 	<ul style="list-style-type: none"> ?? ?? 	University of Natal Press, Pietermaritzburg
Current	<ul style="list-style-type: none"> Mondi Project 	<ul style="list-style-type: none"> Publicity and Awareness Programme aimed at making people aware of the crucial importance of wetlands by producing as much publicity on wetlands and the Project 	<ul style="list-style-type: none"> High high 	Project reports

Mander *et al.* (1996) provide user-friendly guidelines for the cultivation of *Juncus kraussii* (Incema). These guidelines are currently being revised to take account of the field experiences of the pilot incema cultivation project.

The publication by Tainton (2000) is comprehensive on the management of pastures in South Africa. Although little mention is made of wetlands, some specific guidelines are provided for the management of wetland soils in a pasture system.

Although not a direct use of a wetland for cultivation, peat is mined from South African wetlands for use in the mushroom and horticulture industry. Its extraction from wetlands is regulated through the issue of permits by the Directorate of Agricultural Land Resource Management of the National Department of Agriculture, in terms of section 6 of the Conservation of Agricultural Resources Act (No. 43 of 1983). Guidelines for the harvesting of peat are provided by the Peat Working Group (2001). Whilst these guidelines are focused specifically on peat, they do provide a very useful framework for the assessment and legal context of any major development, be it agricultural or otherwise, on a wetland's functioning and values.

The South African Sugar Association provides detailed guidelines for environmentally-sound sugar cultivation practices (Brenchley *et al.* 2001).

In the absence of local studies, the South African country paper has taken cognizance of the similarity of wetlands in that country and those occurring elsewhere in the region (Kotze and Breen, 1994). Zimbabwe is quoted as having undertaken significantly more research, focused specifically on the agricultural use of wetlands. Much of this research from Zimbabwe has relevance to South Africa, including the following research papers: Whitlow (1985); Grant (1992); Mharapara (1992); Maseko & Bussink (1992); Lovell *et al.* (1992); Van de Giesen & Steenhuis (1992); Kundhlande *et al.* (1992).

Strategies on information dissemination

The South African country paper clearly states the shortage of research in the development of wetlands for agricultural purposes other than that which was done for large-scale commercial farming in the past decades. Very little research and development work has been done for the smallholder sector in that country, and hence the lack of information in this regard.

The paper, however, recognizes the need for scanning and utilizing information generated from similar environments in the region, wherever applicable. The observation that it is useful to bear in mind the similarities and differences concerning the different contexts encountered in the respective countries when drawing from such body of research, is highlighted.

Substantial current information exists on environmentally-related work on wetlands, with particular emphasis on protection and conservation. This indicates the value attached to such resources by those at the policy-making levels, in the last few years at least. The country paper indicated a change in the thrust to wetland development from one that supported transformation of these systems to facilitate commercial cultivation to one that places value in the functions of these systems in their undisturbed states.

South Africa has publications available for most of the work that has been done, irrespective of the level of its relevancy to the use of wetlands for agricultural purposes. Some useful lessons can be learned from the studies conducted for commercial agriculture and conservation work in the buildup of information on wetland utilization for agricultural purposes. The paper on South Africa notes the lack of information that there should be feeding on policy and planning, and then for further research on wetlands, to enhance the understanding of these ecosystems in respect of the following:

- ❖ The relative impacts on wetland functioning and values caused by pasture production, mechanized crop production, and non-mechanized traditional cultivation respectively
- ❖ Process-based research undertaken at selected local wetlands. These wetlands could also serve as useful references for assessments (Lemly, 1997; Rheinhardt *et al.* 1997)
- ❖ A national wetland classification and inventory system for palustrine wetlands, including the development of an ecoregion classification system, would contribute greatly to broad-scale planning and consideration of cumulative impacts
- ❖ The development of national protocols to address explicitly prioritization of wetlands within several contexts, including ecoregion and catchment, and using multi-criterion procedures
- ❖ Off-site impacts on the functioning of wetlands, particularly those resulting from reduced supplies of water to the wetland, are poorly understood. Research and protocols relating to this topic would need to be focused on implementing the policy of the Department of Water Affairs and Forestry which considers wetlands, together with other ecosystems, as constituting a legitimate water demand sector
- ❖ Research to enhance understanding of the extent to which the socio-economic factors affect, and are affected by, wetland cultivation
- ❖ Research is required to enhance the approach and effectiveness of extension services in dealing with local people in general
- ❖ Investigation of current policy, legislation and other instruments present at different organizational levels, and their relationship to the sustainable use of wetlands
- ❖ Market research for promoting alternative environmentally-sensitive uses of wetlands, especially crafts
- ❖ Trans-disciplinary studies of individual wetland sites examining the perceptions of individual users, how these are influenced and how this in turn influences the use of the wetland and its state

In the case of South Africa it would be further suggested that the following is considered:

- ❖ Access to these resources needs to be reviewed, as do the land reform programmes
- ❖ Relevant lessons from elsewhere in the region need to be crystallized, translated, and shared with the communities and development agents

8.1.5. Swaziland

Projects and activities

The country paper shows that there is a general paucity of information about wetlands (Table 18) nationally, especially those found on Swazi Nation Land, where most of the rural populations have their livelihood. Most of the available information is fragmented and does not deal with wetlands directly, let alone the use of wetlands for agricultural production.

The country paper highlights the observation that most of the available information on wetlands deals with conservation and protection, and that practically no information is available on how wetlands can be used to support sustainable agricultural production.

Table 18
Past and ongoing projects and activities related to agriculture on wetlands in Swaziland

Period	Project implementer/ Iyrsupporter	Activities	Relevance to Agriculture	Publication and location
Past	<ul style="list-style-type: none"> • Fakudze • 1998 	<ul style="list-style-type: none"> • Wetland survey - people in the Lubombo and Lowveld regions do not think that there are wetlands in these areas - others do not consider swamps, which are inaccessible for their direct exploitation, as wetlands - general agreement among local people on the importance of wetland, major causes of wetland degradation and possible strategies for protecting wetlands 	<ul style="list-style-type: none"> • High - high - low - high 	??
Past	<ul style="list-style-type: none"> • Wetland conference • 1991 (Botswana) • SADC 	<ul style="list-style-type: none"> • Wetland conservation - conservation discussions and guidelines 	<ul style="list-style-type: none"> • Medium - medium 	SADC Wetland Conference proceedings (1991)
Recent past	<ul style="list-style-type: none"> • National Wetland Workshop (Swaziland) • June, 2001 • SADC 	<ul style="list-style-type: none"> • Wetlands - ?? 	<ul style="list-style-type: none"> • ?? - ?? 	??
Current	<ul style="list-style-type: none"> • Wetland conservation project Phase II • Current • SADC 	<ul style="list-style-type: none"> • ?? - technical assistance and exchange of knowledge and experiences 	<ul style="list-style-type: none"> • Medium - medium 	Project plan ??

The lack of organized wetland data banks, which could be readily accessed by all stakeholders, is cited as a sign of poor information-sharing in the country. Some of the activities of a number of institutions relate to wetland development and management, but information about such activities is not shared with relevant stakeholders. Since the 1991 SADC conference on wetland conservation in Gaborone in Botswana, in which Swaziland participated, no follow-up national and regional meetings or workshops to share information on wetlands were held or conducted until 18 June 2001, when a SADC national wetland workshop for Swaziland took place.

Strategies on information dissemination in Swaziland

No information was provided in respect of specific strategies to enhance information dissemination on wetlands in Swaziland. It would, however, be suggested that the following be considered:

- ❖ Enhance the appreciation of wetlands as a resource for agricultural production in the country
- ❖ Draw on the experiences from other SADC countries that have made some progress in the utilization of wetlands for agricultural purposes
- ❖ Promote the implementation of research and development of wetlands in the country
- ❖ Encourage the synthesis, translation, and publication of relevant information on wetlands use and management in local publications

8.1.6. Tanzania

The country paper on Tanzania points out that there has not been any deliberate effort by the Government to design a project on the utilization of wetlands for agricultural development. However, in some places there is evidence that individual farmers are attempting to undertake cultivation of some crops in the wetlands locally-known as “Vinyungu”.

The report describes a number of schemes referred to as irrigation schemes. It is not very clear from the report whether these are genuine wetland projects or conventional irrigation systems that happen to be in valleys. Some of these that appeared to be related to wetlands have been listed in Table 19, but there is lack of clarity regarding to their status. Further clarification is needed from Tanzania.

It appears that there is limited organized work and publications on wetland development for agricultural uses, at this stage, in Tanzania. The newly established Wetland Committee is expected to pull together various players to focus on the development of these resources. It is suggested that this Committee pushes for research and development on wetland resources, emphasizing the need for inventories on the availability, distribution, current uses, systems applied, status of wetlands and importance as food production resource areas, particularly for local communities. Such information should be collated and made available to those that may want to use it for the development of these resources.

8.1.7. Zambia

Projects and activities

In Zambia, there are no legal prohibitions on the use of dambos and thus the conservation of dambo environment has not been critical. This could be due to the relative abundance of fertile land and low population density (10 persons/km²). For a long time, dambos have been used as sources of food security. Cultivation takes place in dambos in the dry season, due to the availability of water and, in some cases, there are fertile soils. Dambos have mostly been used for horticultural and agronomic crops.

Table 19
Past and ongoing projects and activities related to agriculture on wetlands in Tanzania

Period	Project implementer/ Iyr/sponsor	Activities	Relevance to Agriculture	Publication and location
	<ul style="list-style-type: none"> • Special Programme for Food Security • 1995 • Govt & FAO 	<ul style="list-style-type: none"> • To empower smallholder farmers to rapidly increase the crop production and productivity of the staple food crops (rice and maize) - yields and way of life for the smallholder farmers increased - utilization of valleys and flood plains 	<ul style="list-style-type: none"> • ?? - ?? - high 	Not given
	<ul style="list-style-type: none"> • Participatory Irrigation Development Programme (PIDP) • ?? 	<ul style="list-style-type: none"> • To support the smallholder to increase crop production - improved water management at the farm level 	<ul style="list-style-type: none"> • ?? - medium 	Not given
	<ul style="list-style-type: none"> • Sustainable Management of Usangu Wetland and its Catchments (SMUWC) • The Ministry of Water and Livestock Development 	<ul style="list-style-type: none"> • To assess effect of increased cultivation, low river flows, and conflicts due to competition for water - wetland degradation 	<ul style="list-style-type: none"> • Medium - medium 	Not given
	<ul style="list-style-type: none"> • SADC Regional Wetlands Conservation Project Phase II 	<ul style="list-style-type: none"> • To enhance the technical capacity of Tanzania, and relevant partners, to design and implement effective measures required for the conservation and sustainable use of wetland ecosystems in Southern Africa - training 	<ul style="list-style-type: none"> • Medium - medium 	??

The traditional technology employed in dambo cultivation has involved the making of ridges, mounds, or banks in between trenches or furrows. The size of the gardens is usually small (under one hectare). In some parts of Central, Eastern and Southern Lusaka Provinces, where there is a shortage of arable land, main interfluvial gardens are usually extended into dambos. In such circumstances, the subsidiary status of dambo gardens may not be easily distinguished from the primary status of principal interfluvial gardens. In essence, interfluvial and dambo gardens are complementary. Dambo gardens are particularly important in the production of off-season crops for both home consumption and sale, especially when located close to urban centers.

In the livestock rearing areas of the country, dambos have always been used for cattle grazing. The three types of dambos (sweet, intermediate and sour) are used for grazing cattle during the dry season, but an abundance of palatable and nutritious plant species is found on sweet dambos. The sweet dambos of Southern and Central Provinces offer the best grazings in the country and generally have high carrying capacities (1.0 ha/cattle head), whilst the Northern sour dambos, with wiry and unpalatable grasses, have low carrying capacities (4.0 ha/cattle head). However, grazing in intermediate and sour dambos can be improved by either establishing planted pastures of species adaptable to wet conditions or by burning. Wetlands support a lot of cattle, with the traditional sector accounting for 82 percent of cattle in Zambia.

Experiments carried out at Mochipapa Agricultural Research Station in Choma, from 1976 to 1979, showed that some nutritious palatable wetland plant species, when planted, contribute to improved grazing in dambos (Shalwindi, 1986) (Table 20). The report highlights the fact that dambos should not be overgrazed. If they are, they lose their sponge effect. Overgrazing creates bare ground and, during the rainy season, storm water drains off and does not percolate into the soil. The excessive runoff may cause sheet or deep gully erosion, which lowers the water table.

Strategies on information dissemination

The formation of the National Wetlands Steering Committee (NWSC) ensured that there is wide participation in decision making and directing wetlands management in Zambia (Table 20). This marked the beginning of organized national effort in wetland management in Zambia.

Through the Environmental Council of Zambia and the National Wetland Steering Committee, Zambia has put together a number of recommendations. The most relevant include the following:

- ❖ Institutional capacity-building for wetlands management in terms of human, material, and financial resources
- ❖ Systematic holistic environmental monitoring of the management of wetland resources, including dambos
- ❖ Increased research into the sustainability of dambos' agricultural utilization
- ❖ Promotion of aquaculture to increase food security in dambo areas
- ❖ Studies into drainage of water bodies and the hydrology of wetlands and headwaters
- ❖ Economic analysis and commercialization of wetland resources through agricultural, tourism and other uses to be promoted, in order to improve the social welfare of wetland communities and increase food security. The generated funds to be ploughed back into the respective wetland areas through their local community management structure
- ❖ Improved marketing of agricultural produce from dambos
- ❖ Development of wetlands training centres and courses to increase awareness in wetland management for all stakeholders

- ❖ Increased scientific and technical research in wetlands management, including mechanized cultivation and drainage of dambos
- ❖ Encourage sustainable production of cereal crops, e.g. wheat, rice, oats, maize, of alfalfa, and of horticultural crops, e.g. rape, cabbage and tomatoes, in dambo areas
- ❖ Modification of farming systems (organic farming), limiting agrochemical application to permissible levels, and strengthening of EIAs
- ❖ Research in risk areas/sources of wetland pollution/establishment of anti pollution standards/ effective waste-disposal systems (away from catchment areas) needs urgent consideration
- ❖ Measures to minimize bush burning/fires in wetlands involving CBNRMs are needed
- ❖ Time-tested traditional systems adapted to flooding/recession regimes, traditional values, beliefs, taboos, customs and forms of punishment on lawbreakers all need strengthening
- ❖ Renewal of land tenure/incorporation of land use systems/zoning aspects/CBNRMs must be considered. Private land (biological resource) ownership/patents are reported as being alien to African traditions and should not be allowed
- ❖ Linked to all of the above issues, Zambia recognizes the need for (a) development of clear national/ regional strategies for wetland protection and sustainable utilization, (b) strengthening of institutional mechanisms (policy/legal/structural), and (c) implementation of integrated management plans (incorporating CBNRMs, NGOs, private sector) with supporting national/regional coordination and networking linkages

The Zambian report further listed the areas and issues that would need to be addressed at national and regional level, with assistance from elsewhere, and these include the following:

Areas needing assistance at national level:

- ❖ Institutional capacity-building for important institutions involved in agricultural use of small inland wetlands, i.e. ECZ, MAFF, DWA and DoF
- ❖ Increased training and awareness in dambo management
- ❖ Classification and categorization of small inland wetlands, including dambos
- ❖ Prioritization and phased improvement of agricultural use of small inland wetlands, including dambos
- ❖ Promotion of research on hydrology of headwater dambos and their sustenance
- ❖ Environmental monitoring of dambo systems
- ❖ Sustainable crop and animal production practices in dambos

Areas needing assistance at regional level:

- ❖ Institutional capacity-building for key institutions in each country
- ❖ Creation of a database on small inland wetlands research and information exchange
- ❖ Increased training and awareness on small inland wetlands management, including dambos, through seminars, workshops and regional tours
- ❖ Facilitation of the marketing of products within the Southern African region, from small inland wetlands, including dambos, based on comparative advantage
- ❖ Harmonization of legislation on small inland wetlands and dambo management
- ❖ Quantification of the contribution of small inland wetlands and dambos to food security
- ❖ Survey of small inland wetlands from the biological, ecological, and socio-economic points of view
- ❖ Prioritization of the use of small inland wetlands, including dambos, based on their vulnerability to utilization

Table 20
Past and ongoing projects and activities related to agriculture on wetlands in Zambia

Period	Project implementer/ yr/supporter	Activities	Relevance to Agriculture	Publication and location
Past	<ul style="list-style-type: none"> • Shalwindi • 1986 	<ul style="list-style-type: none"> • Research on wetland plant species for grazing - showed that some nutritious palatable wetland plant species when planted, contribute to improved grazing in dambos - dambos should not be overgrazed as this causes sheet erosion 	<ul style="list-style-type: none"> • High - high - high 	Reports at Mochipapa Agricultural Research Station in Choma, Zambia
Current	<ul style="list-style-type: none"> • Environmental Council of Zambia • 1996-1999 • MENR 	<ul style="list-style-type: none"> • National Strategy and Action Plan, 1999 - strategic plan 	<ul style="list-style-type: none"> • High - high 	Ministry of Environment and Natural Resources (MENR)
Current	<ul style="list-style-type: none"> • Phiri, M • 2001 	<ul style="list-style-type: none"> • The Role of The Environmental Council of Zambia (ECZ) in Wetlands Management in Relation to Environmental Legislation - ensures that there is wide participation in decision making and directing wetlands management in Zambia - coordinated development framework 	<ul style="list-style-type: none"> • High - high 	Report presented at the Wetlands Policy Workshop. 28-30 May 2001.
Current	<ul style="list-style-type: none"> • Environmental Council of Zambia 	<ul style="list-style-type: none"> • Study on Improvement of Small Inland Wetlands Utilization and Management - institutional capacity-building for wetlands management recommended - systematic holistic environmental monitoring of the management of wetland resources including dambos recommended 	<ul style="list-style-type: none"> • - high - medium 	Reports location unspecified
Past	<ul style="list-style-type: none"> • Chabwela • 1994 ed. 	<ul style="list-style-type: none"> • Status of Wetlands in Zambia. - assessment of the situation of wetlands 	<ul style="list-style-type: none"> • Medium - medium 	ECZ/MENR/GRZ
Past	<ul style="list-style-type: none"> • Mukanda. N. • 1998 • FAO/SAFR 	<ul style="list-style-type: none"> • Wetland Classification for Agricultural Development in Eastern and Southern Africa: the Zambian Case in Wetland Characterization and Classification for Sustainable Agricultural Development - classification for agricultural uses 	<ul style="list-style-type: none"> • High - high 	Zambia Country Paper- Proceedings of a Sub-Regional Consultation Harare, Zimbabwe 3-6 December 1997. FAO/SAFR

8.1.8. Zimbabwe

Projects and activities

In Zimbabwe, both public institutions (some in collaboration with international organizations) and non-governmental organizations have been involved in projects whose main thrust is on sustainable wetlands development for agricultural purposes. Farmers, both indigenous and settlers, have also made a substantial contribution towards the development of wetlands for agricultural purposes.

The Department of Natural Resources (DNR) has ongoing work, the main objective of which is to map out all the wetlands in Zimbabwe, and to establish an inventory database of these features using the latest available technology in GIS and remote sensing (satellite imagery processing). The project has started with mapping and inventorying wetlands of the Save drainage system. No results were available as yet during the production of the country paper.

The most widely acknowledged programme on wetlands development for agricultural production is the one being currently undertaken by the Ministry of Lands and Agriculture's Department of Research and Specialist Services (DR&SS). This is primarily a research programme whose main focus is on the sustainable utilization of vleis for agricultural production, and the improvement of the well-being of the rural folk in communal areas. It is worth noting that research on dambos by DR&SS is ongoing work, although some activities are on hold due to lack of finance.

The work by Mharapara (2000), culminating into his Ph.D. thesis, should be taken as the integrative publication on wetlands development and management for agricultural purposes in Zimbabwe (Table 21). Some of the findings from his work done at the DR&SS's Chiredzi, Makoholi and Marondera (Horticultural Institute) Research Stations include the following:

- ❖ The Ngwarati cultivation system, consisting of alternating 3-metre wide ridges (cultivated with maize) and 3-metre wide furrows (cultivated with rice) constructed on zero gradient, was the most ideal farming system for achieving optimum yields from maize (6219 kg/ha) and rice (2129 kg/ha) in dambos
- ❖ Using this system, overall grain crops were observed to yield four times more than those from the surrounding rainfed uplands
- ❖ The system proved effective in retaining most of the inflow, and also minimized erosion to very insignificant levels as the velocity of the flow was also reduced, especially on hitting the first ridge
- ❖ Modern varieties of maize and rice proved to be superior to the traditional cultivars

A socio-economic impact assessment of the Ngwarati wetland utilization system in Wedza and Seke revealed that well-managed dambo cultivation had the effect of raising household incomes and food security. Some families were able to purchase assets with money generated by the wetland cultivation project (Guveya *et al.* 2000). This project is a clear indication of the benefits that can accrue to communal families from dambo utilization.

Chigumira *et al.* (1995) reported that the dambos they investigated in the Marondera area had sandy soils whose upper layers (top 30 cm) were rich in organic matter. It was also found that the addition of manure was the simplest way to improve dambo soil fertility.

Table 21
Past and ongoing projects and activities related to agriculture on wetlands in Zimbabwe

Period	Project implementer/ yr/supporter	Activities	Relevance to Agriculture	Publication and location
Current	<ul style="list-style-type: none"> Department of Natural Resources 	<ul style="list-style-type: none"> To map out all the wetlands in Zimbabwe and establish an inventory database of these features inventory of Save drainage system 	<ul style="list-style-type: none"> Medium medium 	Results not yet available
Current	<ul style="list-style-type: none"> Lupankwa, M. Department of Geology, University of Zimbabwe 	<ul style="list-style-type: none"> The use of remote sensing in the study of dambos in Zimbabwe. identifying and mapping out dambos for agricultural development 	<ul style="list-style-type: none"> High high 	Ph.D. thesis entitled "The use of remote sensing in the study of dambos in Zimbabwe"
Past	<ul style="list-style-type: none"> Mharapara 1995 DR&SS 	<ul style="list-style-type: none"> Wetlands development for agricultural production farming systems, soil and water conservation, organic matter and cropping 	<ul style="list-style-type: none"> High high 	Dambo farming in Zimbabwe Water management, cropping and soil potentials for smallholder farming in wetlands. Owen, <i>et al.</i> (1995)
Past	<ul style="list-style-type: none"> Chigumira <i>et al.</i> 1995 DR&SS 	<ul style="list-style-type: none"> Managed vegetable crop trials on dambos sandy soils whose upper layers (top 30cm) were rich in organic matter addition of manure was the simplest way to improve dambo soil fertility 	<ul style="list-style-type: none"> High high 	Dambo farming in Zimbabwe. Water management, cropping and soil potentials for smallholder farming in wetlands. Owen, <i>et al.</i> (1995)
Current	<ul style="list-style-type: none"> Mharapara, I.M. 2000 ARC & DR&SS 	<ul style="list-style-type: none"> Development of wetland (dambo) cultivation systems in Zimbabwe Ngwarati cultivation system developed 	<ul style="list-style-type: none"> High high 	Ph.D. Thesis
Current	<ul style="list-style-type: none"> ENDA-Zimbabwe 2001 	<ul style="list-style-type: none"> Agro-forestry and dambo management research on the role of agro-forestry in maintaining soil fertility on communally-owned dambos in the Matopo area in Matabeleland South to stabilize soils that were previously exposed to erosion on deforested areas aided nutrient cycling through providing prunings as a source of organic matter reduced pressure on existing forests as sources of fencing materials 	<ul style="list-style-type: none"> High high 	Reports location not indicated

Period	Project implementer/ yr/supporter	Activities	Relevance to Agriculture	Publication and location
Current	• DNR	<ul style="list-style-type: none"> • Producing integrated dambo development and management plans with the first implementation targeted for Negondo Dambo in Zimbabwe in Mashonaland West - rehabilitation of gullied dambos 	<ul style="list-style-type: none"> • Medium - medium 	Results not yet available
Past	<ul style="list-style-type: none"> • Agricultural and Rural Development Authority, 1993 	<ul style="list-style-type: none"> • The ecology and status of dambos in the Save Catchment area 	<ul style="list-style-type: none"> • Medium 	Study report at ARDA
Past	<ul style="list-style-type: none"> • Bell, M., Faulkner, R., Hotchkiss, P., Lambert, R., Roberts, N. and Windram, A. 1987 	<ul style="list-style-type: none"> • The use of dambos in rural development with reference to Zimbabwe. 	<ul style="list-style-type: none"> • High 	Dambo Research Unit, WEDC, Loughborough University and University of Zimbabwe
Past	<ul style="list-style-type: none"> • Guveya, E., Chakazunga, D. and Musunga, F. 2000 	<ul style="list-style-type: none"> • A socio-economic impact assessment of the Ngwarati wetland utilization system 	<ul style="list-style-type: none"> • High 	Dept. of Agricultural Economics and Extension, University of Zimbabwe, Harare, Zimbabwe
Past	<ul style="list-style-type: none"> • Matiza, T. 1994 	<ul style="list-style-type: none"> • Wetlands in Zimbabwe - inventory 	<ul style="list-style-type: none"> • Medium - medium 	In Matiza, T. and Crafter, S.A. (eds). Wetlands ecology and priorities for conservation in Zimbabwe. Proceedings. Published by IUCN, Gland, Switzerland
Past	<ul style="list-style-type: none"> • Mkwanda, R. 1995 	<ul style="list-style-type: none"> • Towards a sustainable management strategy for wetlands in Zimbabwe 	<ul style="list-style-type: none"> • Medium 	In Owen, R. <i>et al.</i> 1995. Dambo farming in Zimbabwe. Proceedings. Published by University of Zimbabwe, Harare, Zimbabwe
Past	<ul style="list-style-type: none"> • Whitlow, J. R. 1983 	<ul style="list-style-type: none"> • Vlei cultivation in Zimbabwe: reflections on the past 	<ul style="list-style-type: none"> • Medium 	Zim Agric. J., 80(3):123-135

The University of Zimbabwe's Department of Geology has forged ahead with research work into developing methodologies for identifying and mapping out or delineating dambos through remotely-sensed data. The results are in a Ph.D. thesis entitled 'The use of remote sensing in the study of dambos in Zimbabwe' produced by Lupankwa, M. (2000). Another Ph.D. thesis on the hydrological processes in dambos was produced by Owen, R. (2000). The capacity to map out and carry out inventories of dambos is reported as being available in Zimbabwe, and that collaboration with other interested and lead organizations such as DNR is essential.

ENDA-Zimbabwe is conducting research into the role of agro-forestry in maintaining soil fertility on communally-owned dambos in the Matopo area in Matabeleland South. The Department of Natural Resources, on the other hand, is in the process of producing integrated dambo development and management plans, with the first implementation targeted for Negondo Dambo in Zvimba in Mashonaland West. Plans are also afoot to rehabilitate gullied dambos.

Some research work, done by a variety of researchers ranging from agronomists to hydrologists including Grant (1995), Whitlow (1980, 1983, 1984, 1985), Rattray (1953), Nyathi (1991), Mharapara (1985, 1987, 1994, 1995, 2000), Mazambani (1982), McFarlane (1990, 1995) and Bullock (1988), contributed to the understanding of dambo functions, use, and potential currently available in Zimbabwe.

Strategies on information dissemination

Documentation of the studies and projects referred to in this report are available in institutions and some libraries in Zimbabwe. This literature is fairly accessible to academics and researchers, but less so to most farmers, practitioners and development agents.

The country paper made the following observations in respect of wetland projects and information:

- ❖ No substantive information is available on the inventories on wetlands other than of Whitlow. It is recommended that the establishment of inventories on wetlands be given priority attention. While DNR is the lead organization, cooperation is needed from such institutions as the University of Zimbabwe, Forestry Commission and specialized donor organizations
- ❖ Research has so far been disjointed, and it is recommended that this activity be coordinated by DNR. It will also be tasked with collecting and centralizing documentation of research findings on various aspects of dambos, with respect to the issue of sustainable agricultural development
- ❖ It is recommended that research findings be the basis for reformation of legislation, such as the Streambank Protection Regulation, that currently restricts the utilization of dambos. Such information will also be useful for decision-making purposes on issues pertaining to dambos. There is need to synchronize policy on the utilization of wetlands among the institutions that are concerned with dambos
- ❖ The current institutions are not clearly supportive of wetland development and management. It is recommended that a national strategy on wetland development and management be formulated and implemented. This entails the strengthening of sector institutions, in terms of their capacity to participate in the whole process of sustainable wetland development
- ❖ Target communal populations are unaware of legislation and prohibitions concerning the utilization of wetlands. Awareness programmes need to be intensified, as any meaningful decisions on wetlands require community participation to be successful
- ❖ Other regional countries, such as Zambia and Malawi, have significant experiences in the development and management of wetlands. Such regional experiences can be shared through

conferences, with assistance being appropriately sought in order to develop plans that are acceptable to the rural communities. Conferences are a sure way of sharing and exchanging information as is holding field excursions in each other's countries

In addition to the strategies given in the national report, the following are suggested:

- ❖ promotion of research and development on wetland utilization and management
- ❖ demonstration of projects in the field to the farming communities through field days and exchange visits should be encouraged
- ❖ crystallization of lessons learnt, and subsequent translation into local languages would promote information dissemination to the local communities.

8.2. Summary and Conclusions

In all the countries, projects on wetland research and development, in particular for agricultural purposes, are, on the majority, initiated with the assistance of international organizations and non-governmental organizations. Whilst governments have laid down policies that are relevant to natural resources, these are broad-based and are generally geared for protection of such resources as wetlands. They do not stipulate or encourage utilization for agricultural purposes. This attitude by governments is common throughout the region, and appears to have been established by the colonial administrations that once dominated the region.

South Africa and Zimbabwe are the two countries that had wetlands put to commercial agriculture, and they have some research information that had been gathered in support of this practise. Of the two countries, South Africa still has commercial agricultural activities being practiced on wetlands, for such commodities as sugarcane, maize, wheat, and pastures, although the country paper indicates a decline in the expansion of this practice. In the case of Zimbabwe, commercial wetland cultivation of maize and wheat was viewed as the cause of wetland degradation, which resulted in the enactment of the restrictive legislation that banned the practice and still applies to this day.

All the country papers give an indication of the dawning realization of public institutions about the need to do something about the wetlands in their countries. The clarity and relevance to agriculture of what is to be done varies between countries, ranging from Lesotho, where the primary concern is to conserve the wetlands, through to Zambia and possibly Zimbabwe, where the drive to promote agricultural activities on wetlands has taken some strides. The establishment of wetland committees/councils in Tanzania and Zambia is an indication of the recognition by institutions of the importance of these natural resources in those countries. It is expected that these committees/councils will form the focal point for information and decision-making on the development, utilization, and management of wetlands. Reports from the other countries did not indicate such a development.

The picture emerging, in respect to information on wetland development for agricultural purposes, is one of acute shortage and poor dissemination of the little that is available. A few countries, like South Africa and Zimbabwe, have been able to collate a substantive amount of information in the form of publications and internal reports on the subject of wetlands. This could be attributed to the fact that the research in these countries to support the commercial activities that were being promoted on the wetlands dates back to the early 1930s. In the other countries, research has been scanty, hence the limited information. Whilst in Zambia and Mozambique there is no restriction on the utilization of wetlands, until very recently there has been no concerted effort to support the traditional systems of utilization that evolved in these ecosystems.

All country papers indicated a lack of organized databases with information pertaining to wetland uses for agricultural purposes. This has been a source of frustration for those looking for the information, including the national consultants, and an obvious let-down for those communities that need the information for their livelihoods. It is apparent that those indigenous farmers practicing wetland agriculture in the various countries have to rely on their own experiences and initiatives, as they are getting little or no technical support from the service institutions. In South Africa, whilst large commercial enterprises have long existed on wetlands and with technical support, there has been no such service for the smallholder farmers.

Information sharing and dissemination on wetlands for agriculture has a very low rating in the region as a whole. None of the country papers indicated strategic activities that promoted information exchange, in this field, at local levels. This tends to suggest that the communities are not given the opportunity to share the details of both policies and national strategies, or functions and values in respect to wetlands beyond the restrictive laws that prohibit them from practicing specific types of uses of these resources. The use of village meetings, field days, exchange visits, and simplified literature in village libraries has been found to be effective in the Zimbabwean wetland programme (Mharapara, 2001). The sharing of information at regional level is equally poor. There have, however, been some limited attempts in promoting an exchange of information through workshops supported by regional and international organizations, such as SADC, IUCN and FAO, but there is still a lot that needs to be done. Except for the Swaziland paper, there was very little mention of meetings and workshops on wetlands in the region, other than as sources of some references.

Publications for research and development on wetlands are scarce in the region, and the option to publish in international journals, though tempting, does not help the region. Most publications quoted in the reports are not readily available to the common users since they are either located in the institutions that carried out the work or are outside the region. None of the country papers cited a translated version of any of the wetland work into a local language, nor was this proposed as a possible strategy to enhance dissemination.

Not all country papers presented potential opportunities to improve the dissemination and sharing of information, either national or regionally. Zambia, Zimbabwe and South Africa, however, indicated some areas needing attention and their proposed activities to advance wetland utilization.

8.3. Recommendations

Drawing from the information presented, the following recommendations are outlined:

- ❖ There is need to undertake focused research and develop specific guidelines for the agricultural development and management of wetlands in all countries
- ❖ To make up for lost time, and use resources efficiently, some of the basic/thematic issues pertaining to wetlands should be identified and allocated to those countries with the capacity to implement them on behalf of all the others in the region
- ❖ All the countries, without exception, would benefit from the mutual sharing of information and experiences. Thus, facilitation to make this happen is vital. International organizations should play a key role in this area, as it would be difficult for national programmes to implement this on their own
- ❖ Those countries that have gained and used some specialized expertise in such aspects as remote sensing, and the measurement of hydrological processes and wetland use systems should be encouraged to share, assist, and impart skills to the others in the region

- ❖ The establishment of a regional wetland database is a must. This should be fed by national databases coordinated by capable national institutions that have the capacity to collate information systematically and regularly. The regional database has to be located in and managed by one of the regional countries, with the assistance of the international organizations
- ❖ All countries should establish wetland-working groups (councils, committees, etc.), which would form the focal points to all information, projects and activities on wetlands. These groups should seek and establish formal recognition from the respective governments and be placed in the most acceptable and facilitative institution the country has
- ❖ Wetland development cuts across many disciplines and it should be carried out through a coordinated programme approach, by multi-disciplinary teams or institutions. In this respect, coordination is a critical factor
- ❖ It is highly recommended that all eight countries develop strategic wetland plans that are supported by their respective governments and the majority of stakeholders
- ❖ In all those countries where the use of wetlands for agricultural purposes is viewed as illegal, there is a need to collate accurate and relevant information (nationally and regionally) that justifies to policy makers the need to conduct research, and to develop them for such uses. Policy-makers should be furnished with the information that “buys them in” and helps them make appropriate decisions

Key paper 4:

Training and education on wetland use for agricultural purposes

Wetland development and utilization in the different SADC countries is at different levels, depending on the different backgrounds, focus, and values attached to wetlands at national level. Training activities arising from the identified needs would be expected to be equally variable, depending on the circumstances prevailing in the specific country.

In this chapter, training activities on wetlands for agriculture are tabulated for each country and this is accompanied with summarized accounts of any relevant information in respect to approaches, needs, and opportunities. An indication as to whether such activities are ongoing or completed, and their relevance to the development and utilization of wetlands for agricultural purposes, is reflected. These lists also indicate the publications and their sources and location, wherever applicable.

Brief summaries and reviews of the information on strategies to enhance and strengthen existing training curricula and/or programmes are provided in the body of the text, on a country basis, for only those aspects considered relevant which cannot be contained in the tabulated summaries. At the end of this chapter a summarized comparative assessment is given.

9.1. Training and education activities and strategies for improvement

9.1.1. Lesotho

Training and education activities

Lesotho has not developed any specific training programmes focused on the use of wetlands for agricultural purposes. The country paper points out that all reviewed policy documents, scientific and technical reports on wetland conservation, and development and management in Lesotho do not adequately cover aspects of agricultural production. The country is battling with the problem of wetland degradation, particularly in the highlands of the country, and even this field has not been adequately supported by strategic training programmes. Both the government and the public lack awareness regarding the value of wetlands, hence the absence of initiatives to address the problems and opportunities that surround these natural resources.

There is general lack of capacity, financial resources, and political will at national level for the effective implementation of measures for conservation and development of wetlands for agricultural purposes. In addition, there is lack of coordination between the different government institutions that are responsible for the different aspects of wetland conservation, development, and management.

At present the curricula in various institutions, including the agricultural faculty, do not sufficiently incorporate environmental issues in courses related to wetlands.

Strategies to enhance and strengthen existing training activities

The National Curriculum Development Centre of the Ministry of Education has recently launched the Lesotho Environmental Education Programme, with the assistance of DANCED. The programme is intended to support environmental education initiatives in all primary, secondary, and tertiary institutions through curricula reviews, and capacity-building over a period of three years. This project plans to support the following components:

- ❖ Capacity development of relevant bodies concerned with curriculum development, and support to immediate issuing of amendments to the current curriculum in order to enhance the environmental education content
- ❖ Capacity development on institutional level for in-service and pre-service training for improving the implementation of environmental education
- ❖ Capacity development of curriculum performance monitoring, with special emphasis on monitoring of environmental education as a cross-cutting theme
- ❖ Establishment of model schools, with the purpose of creating a considerable resource of practicing and experienced teachers for diffusion of environmental education

The proposed plans would have limited impact on the management and utilization of wetlands unless specific reference and strategies are aimed at the wetlands.

The formal training courses, as indicated in Table 22, although concerned with natural resources management, are too general and not specifically focused on wetlands. The only course that was closely related to wetland use was the two-week “Planning and Management of Watersheds and Wetlands under the Environmental Capacity Enhancement Programme (ECEP) Course”, facilitated by the University of Guelph, Canada.

The lack of government-supported projects in the use of wetlands for agricultural purposes in Lesotho could account for the absence of in-service training in this regard.

9.1.2. Malawi

Training and education activities

Whilst in Malawi it has been recognized that environmental education, at all levels, is important in the implementation of various strategies, particularly in the enhancement of the appreciation of the need to use environmental resources in a sustainable manner, training has not received much attention in the curricula of formal educational institutions in the country.

The country paper refers to a number of colleges and universities that have courses dealing with environmental issues, but these are very general and standard courses, which will hardly have an impact on the management of wetlands for agricultural purposes if they are not improved (Table 23).

Empowerment of local communities through community participation is inadequate, although the country paper expressed hope for improvement due to the recent decentralization policy and the Local Government elections.

Table 22
Institutions and training courses related to the use of wetlands for agricultural purposes in Lesotho

Institution	Faculty/Section	Programmes	Relevant courses	Relevant course components	
National University of Lestho	Science	Honours - Conservation biology	B 544 Afroalpine Ecology	Functions and importance of highlands mires; their threats and conservation requirements	
	Agriculture	Degree (BSc)	<div><div>➤ CPS 222 Elements of Land Water Management</div><div>➤ ANS 324 Range Management</div></div>	Principles of water conservation practices and structures; measurements, distribution and control of irrigation water; water-lifting devices and selection criteria, practices and reclamation of water logged areas Range terminologies. Rangeland productivity in Africa. Taxonomy and ecology of range plants. Environmental effects on the soil-range plant-animal relationship. Range improvement, management and improvement	
		Diploma	<div><div>➤ FRM 203 Soil and Water Conservation</div><div>➤ FRM 239 Introduction to Watershed Management</div></div>	Soil and water as natural resources. Soil erosion; factors responsible for soil erosion; soil erosion agents; universal soil loss equation; principles of water erosion; principles of wind erosion; soil and water conservation Definitions and terminology: Watershed as a unit for planning and development. Watershed behavior. Principal watershed of Lesotho. The potential values of watershed in Lesotho: Watershed planning, inventory, formulation of objectives, plan, project implementation and evaluation. Integrated watershed management	
High Schools (Ordinary Level)	Science	O-Level Certificate	➤ Agriculture 5038	Extensive and Intensive pasture management	
Secondary Schools (JC)	Agriculture	Junior Certificate	➤ Conservation	Soil conservation on uncultivated and grazing land; wider aspects of conservation; conservation in the village.	
Primary Schools	Agriculture	Primary School Certificate	➤ Conservation and Range Management	Soils and Water Conservation; range management.	
CAPACITY-BUILDING TRAINING WORKSHOP ON WETLANDS					
Institution	Target group		Course	Course content	Year
University of Guelph (Canada) (Environmental Capacity Enhancement Programme for Southern Africa) Course Venue: Malawi Duration: 2 Weeks	Policy-makers, water resources specialists, ecologists, planners and managers in Southern Africa (including Kenya)		Planning and Management of Watersheds and Wetlands under the Environmental Capacity Enhancement Programme (ECEP)	Principles of hydrology, integrated catchment management, wetland management, conflict management, EIA, application of GIS	1996

Table 23
Institutions and training courses related to the use of wetlands for agricultural purposes in Malawi

Formal training				
Institution	Courses	Method (Formal)	Subject matter	Potential for improvement to serve purpose
The Polytechnic Departments of Environmental Health and of Applied Studies, Faculty of Applied Studies	Bachelor of Science programmes	Lecture	Environmental Health and in Environmental Science and Technology	➤ High if wetland included
Chancellor College - Faculty of Science	Master of Science	Lecture	Environmental Sciences natural resource management, utilization, and monitoring, as well as public health issues	➤ High if wetland included
Bunda College of Agriculture	Bachelor	Lecture degrees	General agriculture, irrigation. agriculture engineering	➤ High if wetland included
The Natural Resources College	Diploma	Lecture	➤ Land-based resources ➤ Forest & wildlife ➤ Aquatic resources	➤ High if wetland included ➤ High if wetland included ➤ High if wetland included
Informal training				
Various programmes	Radio	Lecture	Messages about the sustainable utilization of wetlands	➤ High but may be limited by lack of radios
	Drama	Participatory		➤ High
	Print, media posters or magazines (informal)	Lecture/reading		➤ High but needs facilitation and funding
ZBWCRUP	Exchange visits	Participatory	Soil and Water Conservation	➤ Low if not specific

Strategies to enhance and strengthen existing training activities

The country paper stresses the fact that all institutions that deal with natural resources utilization and conservation clearly require trained manpower. Whilst it is not indicated in the country paper, it would be suggested that these institutions also need to develop training initiatives focused on wetlands and supported by research activities.

Malawi is currently advocating an approach that combines community participation, coordination amongst actors in the environmental management systems, and environmental education. The problems in implementing such a strategy are cited as being the lack of ownership by the communities due to the tenure system, and limited understanding and commitment by the individual members of the communities.

The country paper cites examples of other programmes that have started using community education through radios, print media, exchange visits and drama. These have potential but need support and facilitation. They would be more effective if used in conjunction with the development of appropriate ongoing projects. Exchange visits and drama are the only participatory methods indicated in the country paper, the others are more formal and tend to be lecture-type.

9.1.3. Mozambique

The Mozambican paper did not present current training activities on wetlands used for agricultural purposes. Although this may be the case, one would expect that some level of training would be taking place in the programmes and projects that are being supported by international organizations, including FAO and IUCN, and within the research project of INIA.

The country paper acknowledges the lack of information in respect to wetlands used for agricultural purposes in Mozambique, but appreciates the importance of these ecosystems in sustaining a “significant group of small farmers that rely on wetlands for food security and household income”. Based on this justification, the country paper argues for the need for “more” training and awareness, particularly for training institutions that include agricultural universities and schools. Training courses are also being advocated for the extension services and local authorities, in order to increase their awareness about the importance and fragility of wetlands.

9.1.4. South Africa

Training and education activities

While relevant training modules exist in some training institutes, those related to wetland development and management are, in general, poorly coordinated and integrated. In addition, little research has been conducted on the small-scale cultivation of wetlands in South Africa.

Most agricultural colleges and technikons in South Africa either provide only a general introduction to wetlands and their values or provide no information (for example, Tsole College of Agriculture and Tompi Selek College of Agriculture). Some of the agricultural colleges, such as Cedara Agricultural College, have training in the drainage of poorly drained soils (Table 24). However, this is geared primarily to large-scale, mechanized cultivation and is generally not integrated with an overall approach to management of wetlands.

The Mondri Wetlands Project (previously called the Rennie Wetlands Project) works, nationally, outside declared nature reserves, where most of South Africa’s wetlands are located to conserve wetlands. This occurs both at grassroots and political decision-making levels. The Project promotes the wise use, rehabilitation, and sustainable management of palustrine wetlands (predominantly wet

meadows, marshes and floodplain wetlands) to commercial farmers, government agricultural and conservation extension services, historically disadvantaged rural communities, and key decision-makers, on a national basis. This is achieved through the five programmes that it operates, including training. The training is aimed at developing the capacity of students at tertiary education institutions, implementers of wetland rehabilitation, and government agricultural and conservation extension services to understand better:

- ❖ The dynamics of wetlands and assessment of their condition
- ❖ Effective wetland rehabilitation
- ❖ Sustainable wetland utilization and management
- ❖ Functional assessment and impact prediction
- ❖ Development of awareness and training materials

Some of the observed outputs and outcomes of the training activities for smallholder farmers are associated with the utilization of some of the wetlands for cultivating *incema*, (sponsored by LandCare) an indigenous plant species that has a market value within South Africa (Table 25).

Being associated with a project in which the farmers are growing the *incema* themselves, the training programme appears to be participatory in nature. This is an innovative approach, in which a plant that naturally occurs in wetlands has been domesticated and adapted to cultivation for increased, yet sustainable use. The approach has found a compromise and harmony between the need for conservation (training to grow a crop of that natural habitat) and creating value and markets for the cultivated resource, thereby providing an incentive for the community to look after the ecosystem.

Strategies to enhance and strengthen existing training activities

There is evidently a strong appreciation for the need and role of training in the development and utilization of wetlands in South Africa.

The Mondi Wetlands Programme has recently developed a specific training programme and is busy expanding the training that it provides, as well as catalyzing training by other institutions. Its objective of developing the capacity of extension services, of implementers of wetland rehabilitation, of DWAF, of national, provincial and local environmental departments and of students of tertiary education institutions, will have the effect of creating a wide base of service providers in the country. According to the country paper, the Mondi Wetlands Project offers the broadest range of training relating to the development and management of wetlands in South Africa.

The other strategy employed by the Mondi Project is, through encouragement of the WESSA environmental education staff, to develop materials and run teacher-training courses on wetlands.

Some of the recommendations regarding training include the following:

- ❖ Support for the development and strengthening of working groups, especially within the priority areas of concern, through which fieldworkers from different departments can work synergistically
- ❖ A Strategic Environmental Assessment (SEA) should be undertaken concerning the cultivation of wetlands, which will allow cumulative impact considerations to be accounted for and will assist in identifying priority areas within which to strengthen through training in wetland cultivation at grassroots level
- ❖ Capacity-building of field workers through focused training, based on the developed resources, and through involvement in regional working groups

Table 24

Institutions and training courses related to the use of wetlands for agricultural purposes in South Africa

Formal training					
Institution	Courses	Method (Formal)	Subject matter	Relevance to wetland use for agricultural purposes	Potential for improvement to serve purpose
Cedara Agriculture College	Certificate	Lecture	General information on wetland values and wetland conservation	➤ Low	➤ High
Mangosuthu Technikon	Certificate	Lecture	General information on wetland values and wetland conservation	➤ Low	➤ High
Mondi Wetland Project	??	Participatory	➤ General information on wetland values and wetland conservation ➤ Detailed information on wetland functioning ➤ Detailed information on management of natural wetlands ➤ Technical aspects of wetland drainage	➤ Medium ➤ Medium ➤ Medium ➤ Medium	➤ High but may be short term depending on project lifespan
Port Elizabeth Technikon: George Campus	Certificate	Lecture	General information on wetland values and wetland conservation	➤ Low	➤ High
University of Natal	Degree	Lecture	General information on wetland values and wetland conservation	➤ Low	➤ Medium
Informal					
The Valley Trust	??	Participatory	Sustainable, low external input agriculture	➤ Low in subject matter but high in approach	➤ High if made specific on wetlands
The Farmer Support Group and Acat	??	Participatory	Sustainable, low external input agriculture	➤ Low in subject matter but high in approach	➤ High if made specific on wetlands

Table 25

Outputs and outcomes of the LandCare training programme in South Africa

Outputs of project	Outcomes of the activities
<i>Incema</i> seed and expertise on <i>incema</i> propagation was supplied to two nurseries, Vuma and TopCrop. This resulted in the nurseries producing over 6 000 plants	The capacity has been built at Vuma, now a community-based nursery, for <i>incema</i> propagation. Propagation material to be used at several of the identified sites was produced
Expertise, encouragement, training and wildstock has been provided to seven sites in KwaZulu-Natal, including: three small scale farmers at Dokodweni, a community garden at Mbazwana, the Amatikulu Prawn Farm and the Albert Luthuli Training Centre, Groutville. An experimental plot was also established in Pietermaritzburg	<i>Incema</i> plots have been established at all of those sites supplied. Initial establishment was very good at all of the sites, except for a portion of the Albert Luthuli Training Centre site, which dried out over the Christmas period and mortality of recently planted <i>incema</i> was high (>50%). At all of the other sites survival of plants was >85%, and regular weeding was undertaken. However, one of the small scale plots at Dokodweni had not been well maintained through weeding
Training in production, sales and marketing has been provided to a craft group in Amatikulu	The capacity of the group has been increased. However, the group is not yet well linked to markets and remains relatively dependent on outside support to assist them with marketing

On one hand, South Africa appears to have developed a substantial capacity to train on wetlands in respect to their physical parameters, conservation, and large-scale commercial cultivation of these environments. On the other hand, it has serious limitations of experiences of smallholder agricultural activities on wetlands.

9.1.5. Swaziland

Training and education activities

The country paper asserts that Swaziland has limited technical and financial capacity to effectively develop and manage its wetland resources. It has been observed that there is limited institutional capacity to train professional and technical personnel in specialized areas of wetland management.

The problem of lack of technical resources is compounded by the absence of wetland related courses in the country's educational institutions. A survey of primary, secondary and tertiary education institutions in Swaziland shows that there are no courses that cover or relate directly to wetland development and management. Wetlands are simply mentioned in hydrological and biological courses or environmental sciences as part of wider ecosystems. The country paper highlights this as a serious gap in wetland development, utilization, and management in the country.

Strategies to enhance and strengthen existing training activities

The country paper recommends the need to develop courses on wetland to be incorporated into the curricula of the country's training institutions that cover natural resources. The NGOs that work with communities in natural resources management provide channels through which activities on wetland management can be implemented (such as SFDF). The country has training institutions that are capable of providing training in wetland management, once wetland courses are developed and included in their curricula.

It is also suggested that the Swaziland national programme could benefit from the experiences of the other SADC countries that have some capacity and experiences in the management of wetlands for agricultural purposes.

9.1.6. Tanzania

Training and education activities

The national report recognizes the availability of universities and colleges that offer standard courses in plant, soil and water management. These institutions include Sokoine University, University of Dar Es Salaam, Kilimanjaro Agricultural Training Centre (KATC) Moshi, Mkindo Farmers Training Centre, Nyegezi Irrigation Institute, and MATI. The country paper, however, indicates that there is not yet sufficient knowledge on wetlands to allow for a specific curriculum to be developed on wetlands for inclusion in the curricula of the courses offered by these institutions.

Strategies to enhance and strengthen existing training activities

It is recommended that the following be considered:

- ❖ Capacity-building in developing some wetlands training modules for inclusion within the ongoing courses, with subjects related to water resources that are conducted in the universities
- ❖ Full wetland course modules for institutions that are offering diplomas or degrees
- ❖ Training of farmers and technicians for tailor-made courses in wetland management

9.1.7. Zambia

Education in wetlands management is done both formally, through the education system in one way or another, and informally, through the tradition system's socialization process.

The formal training institutions, which have a bearing on wetlands management, are the University of Zambia (UNZA), The Natural Resources Development College (NRDC), the fisheries colleges, i.e. Mwekera and Kasaka, and Mwekera Forestry College.

Other means of education and public awareness are through the Environmental Council of Zambia's Environmental Education and Communications Unit (EECU), the Environmental Support Program (ESP), Environmental Education and Public Awareness (EEPA), Community Environmental Management (CEMP) components, the Curriculum Development Centre (CDC), electronic and print media agencies, other government departments, NGOs (both local and international, for example WWF, IUCN, WECSZ, ECAZ, ZAWA) and Community Based Organizations (CBOs).

Issues pertaining to the ongoing strategies to enhance and strengthen existing training activities were not identified in the report.

9.1.8. Zimbabwe

Training and education activities

Zimbabwe has no specialized training courses in wetland development and management for agricultural purposes. However, according to the DNR officers their institute do have some topics on wetlands in some of their training courses, although no syllabi were available. It can also be stated that Agritex has some topics on wetlands, especially in the training of its planners in the field of land capability classification whereby wetlands are designated class V. This class indicates unsuitability for agricultural development. Such training is available to those who attend agricultural colleges like Gwebi and Chivero.

The University of Zimbabwe's Departments of Agricultural Engineering, Geology, Geography and Environmental Sciences carry out frequent research activities in dambos, the processes and findings of which they occasionally include in their lectures. These, however, have not been officially incorporated into the University's curriculum.

DR&SS has been the main player in research and development on various aspects of wetland agriculture in Zimbabwe. The department, through the Lowveld Research Stations, has provided considerable in-service training for the scientists, technicians and extension personnel that were or are associated with the research programmes. These are located at Makoholi and Grasslands Research Stations, where most of the on-station agricultural wetland work has been conducted for the past 18 years.

Farmers have received training on wetland management for agricultural uses through participatory adaptive trials established within the communal areas of Seke (one site), Gutu (one site), Wedza (one site), and Shurugwi (three sites) districts.

Strategies to enhance and strengthen existing training activities

With respect to the information collected and presented in the country, the following are areas that are recommended as requiring attention to enhance and strengthen training activities in wetlands used for agricultural purposes in Zimbabwe:

- ❖ Formal training on dambo development and management is still a far cry, thus it is recommended that specialized short training courses be developed and implemented. These courses should be targeted at the multi-disciplinary community involved in the various aspects of dambos
- ❖ Research has so far been disjointed and it is recommended that this activity be coordinated by a given organization, which will also be tasked with collecting and centralizing documentation of research findings on various aspects of dambos, with respect to the issue of sustainable agricultural development
- ❖ Research findings should be the basis for reformation of legislation that currently restricts the utilization of dambos. Such information should be used in decision-making processes on issues pertaining to wetlands
- ❖ Target communal populations are unaware of legislation and prohibitions concerning the utilization of wetlands. Awareness programmes need to be intensified, as any meaningful decisions on wetlands require community participation to be successful
- ❖ Other regional countries, such as Zambia and Malawi, have significant experiences in the development and management of wetlands. Such regional experiences can be shared through conferences, with assistance being appropriately sought in order to develop plans that are acceptable to the rural communities. Conferences are a sure way of sharing and exchanging information as is holding field excursions in each other's countries

9.2. Summary and conclusions

Based on the information reported in the country papers that have been discussed above, the following summations and conclusions can be drawn:

- ❖ None of the eight selected countries in the SADC region have developed or officially incorporated courses/programmes specifically designed for wetland management and utilization for agricultural purposes into the formal academic or vocational educational curricula. South Africa, through the Mondi Project, comes closest to having an officially recognized, organized, and consolidated training programme on wetland utilization and management for agricultural purposes. Possibly the only notable weakness with the Mondi Project, compared to the rest of the region in this respect, is its limited experience of smallholder agriculture. For this reason, there might also have been limited stakeholder consultation from the smallholder sector in the development of the training modules that have been put together by the Mondi Project. The rest of the countries basically have no

training material specifically put together for training farmers or technical personnel in the management of wetlands for agricultural purposes

- ❖ Reports from these countries indicate that there is a general tendency to assume that the general training courses and materials on natural resources will address the wetland issues. These courses, at Colleges and Universities, are of a very general standard, and will hardly have an impact on the management of wetlands for agricultural purposes if they are not improved
- ❖ Other than Zimbabwe, a very small percentage of the countries have supported some research and development on the management and utilization of wetlands for smallholder agricultural uses. Efforts by South Africa and Lesotho are heavily biased towards conservation and, the case of the former large-scale commercial farming in earlier times. This lack or absence of research consequently results in the shortage of training materials within the respective countries
- ❖ Empowerment of local communities through community participation is inadequate in most of the SADC countries. In a few of the countries, viz. Malawi, South Africa and Zimbabwe, the reports expressed some hope for improvement. The Malawi report pins hope on the recent changes in policy decentralization and the Local Government elections, whilst the Zimbabwean and South African reports envisage increased access through the land resource redistribution policies that are being implemented. Zambia is in the process of consulting stakeholders for purposes of putting an appropriate policy together
- ❖ The problems of poor coordination and lack of technical and financial resources to support appropriate training were highlighted by most national reports
- ❖ Non-governmental organizations mentioned in the reports appear to be more sensitive to the involvement of communities and the building of their capacities to manage such resources than were government institutions. The latter appear to be more concerned with the technical aspects of conservation and paid little attention to social dimensions and benefits
- ❖ Insufficient information appears to have been supplied on regionally based training activities in the field of wetlands. References have been made to workshops and meetings conducted in the region, it is, however, not clear whether any of these provided some level of training or not
- ❖ The potential for training in the policy, technical, and social aspects of wetland management and utilization for agricultural purposes is immense in the SADC region

9.3. Recommendations

The following recommendations are drawn based on the information provided:

- ❖ Countries in the SADC region need to recognize the uniqueness of wetlands as a potential resource for agricultural uses. There is a need to develop training courses that are specifically targeted to the sustainable conservation, management, as well as to utilization of these ecosystems for agricultural purposes
- ❖ For appropriate and effective development, the training courses need to be supported by research and development programmes that would continually generate relevant, up-to-date information feeding into the courses
- ❖ Courses need to be built into the existing curricula within schools, colleges, and universities in order to make use of the existing training frameworks
- ❖ In-service training on wetland management and use for agricultural purposes, which is currently very limited in most countries, needs to be built and promoted around projects. South Africa (Mondi Project), the Zimbabwe programmes on wetlands, and the FAO supported projects in the various countries all seem to have referred to some capacity-building of the local communities

participating in these projects. It could be inferred that this implies training of these communities. If this is so, it would be recommended that this be spread to other communities within these countries and those in other SADC countries

- ❖ The above recommendation implies the need for shared training between countries which could be achieved through the use of exchange visits, improved syllabi, attachments, etc facilitated by regional or international organizations, making use of programmes that have something to learn from
- ❖ It is evident from the national reports that some current institutional or organizational arrangements constrain training activities. There is need to support the development and strengthening of working groups, especially within the priority areas of concern at grassroots level, through which fieldworkers from different departments can work synergistically for mutual benefit
- ❖ In the few cases where relevant training on wetland management has been reported in the region, the majority of cases appear to be lecture-based. There have been very few citations of participatory training methods in the reports. This, however, could be happening in the projects, but that the reports did not specifically allude to this aspect specifically
- ❖ It would be recommended that national programmes articulate, in their training and research, the value addition that can be realized on wetland resources through appropriate management and utilization for agricultural purposes. This added value would act as the incentive critical to their management and conservation by the communities
- ❖ National programmes should provide guidance to non-governmental organizations, but at the same time endeavour to create shared visions with them and allow them to catalyze and demonstrate new areas of development

Key paper 5:

The importance of wetlands for agriculture in SADC countries

10.1. The SADC region

The Southern African Development Community (SADC) was formed in 1977. There are currently 14 countries participating in SADC, and Kenya is an observer country. These 14 countries comprise the following: Angola, Botswana, Democratic Republic of Congo, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia, Zimbabwe (Figure 1). Namibia has the lowest population density with 2 people per km², whilst the Seychelles have the highest in the region with 175 people per km². On the other hand, the Seychelles have the lowest population growth rate (0.65 percent per annum) whilst the Democratic Republic of Congo has the highest (2.99 percent per annum).

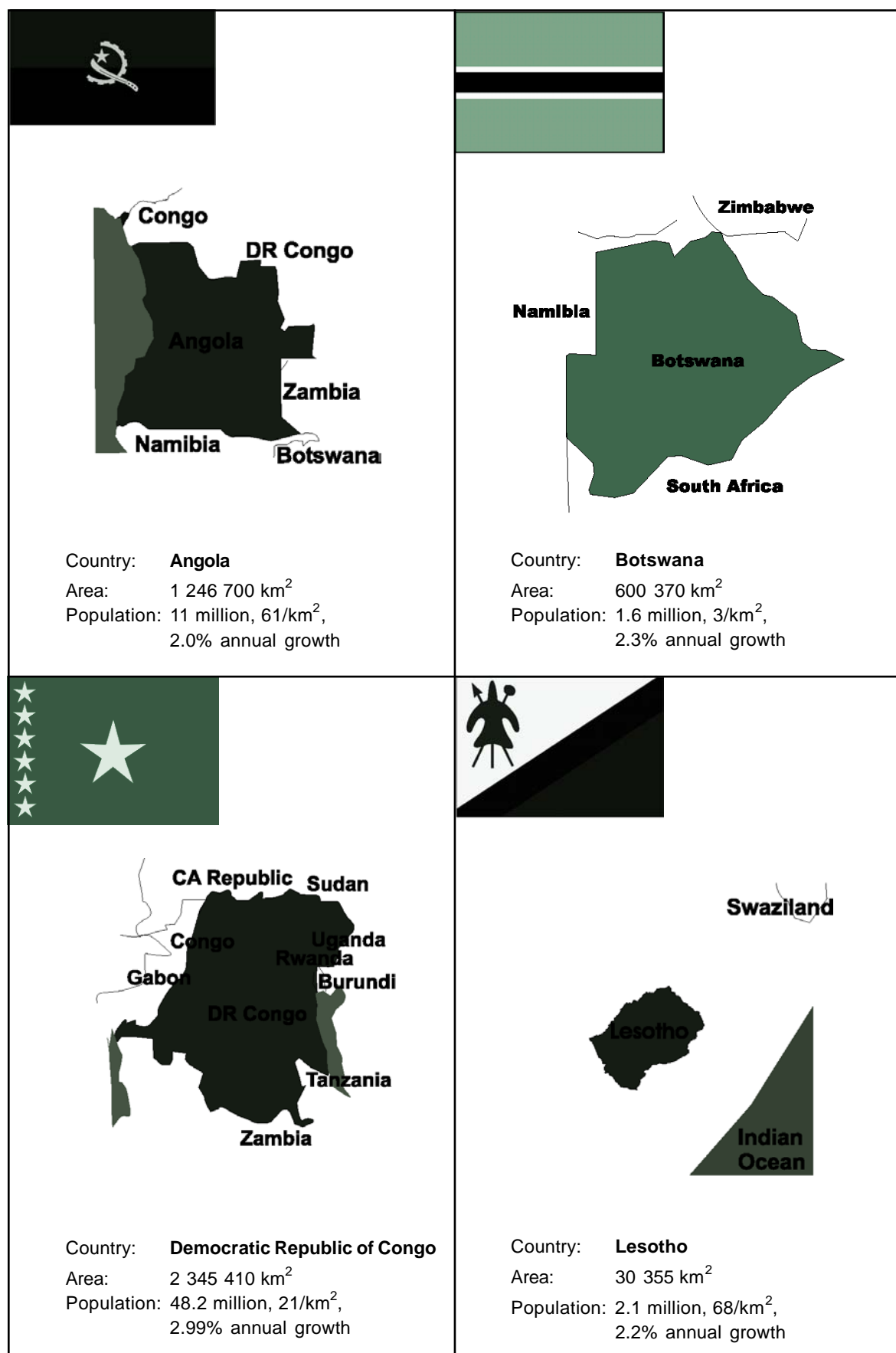
The forerunner of SADC was the Southern African Development and Coordinating Conference (SADCC), which was created, firstly, as a counter to the then South Africa's idea of the Constellation of Southern African States (CONSAS) and, secondly, to reduce economic dependency on the then apartheid-ruled South Africa.







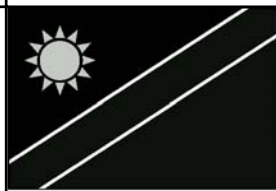

SADC has a number of protocols established for purposes of corporation and coordination between countries on matters of common concern and interest. These include, among others: organs for politics; defense and security, whose mandate is generally inter-state defense and security cooperation; agriculture, focusing on training; technology generation and sharing in land and water management, production and marketing; environment and land management aimed at promoting the development of Environmental Information Systems (EIS) in Southern Africa. The agricultural, environment, and land management activities are the ones most relevant to the wetland issues.



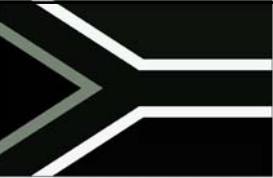





10.1.1. Agriculture related activities

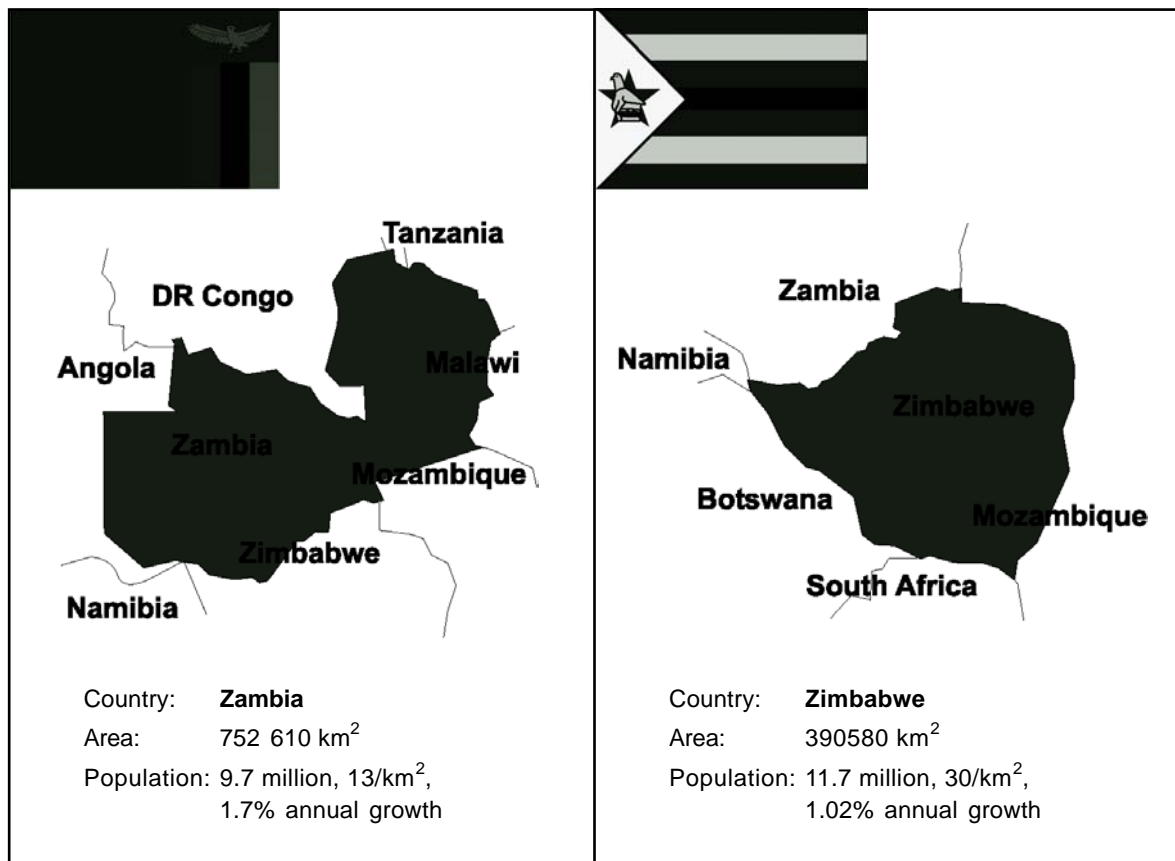
The SADC Land and Water Management Research Programme (L&WMRP) was supported by member countries and managed under the auspices of the Southern African Centre for Cooperation in Agricultural Research and Training (SACCAR), based at Sebele in Botswana. The European Development Fund (EDF)/Commission of the European Communities (CEC) provided technical assistance, by funding, for the establishment of the "Regional Resource and Training Centre for Land and Water Management Research Programme", initiated in 1990. The training centre is still at Sebele in Botswana, but the financial support programme was phased out in October 1994.

Figure 1
The 14 SADC countries (not to scale)



  <p>Country: Malawi Area: 118 480 km² Population: 10.5 million, 112/km², 1.57% annual growth</p>	  <p>Country: Mauritius Area: 1 860 km² Population: 1.2 million, 571/km², 1.18% annual growth</p>
  <p>Country: Mozambique Area: 801 590 km² Population: 16.9 million, 22/km², 2.4% annual growth</p>	  <p>Country: Namibia Area: 824 290 km² Population: 1.7 million, 2/km², 1.57% annual growth</p>

 <p>Indian Ocean</p>  <p>Seychelles</p> <p>Country: Seychelles Area: 455 km² Population: 6 million, 175/km², 0.65% annual growth</p>	  <p>South Africa</p> <p>Country: South Africa Area: 1 221 040 km² Population: 41.4 million, 34/km², 1.32% annual growth</p>
  <p>Swaziland</p> <p>Country: Swaziland Area: 17 360 km² Population: 0.89 million, 57/km², 1.96% annual growth</p>	  <p>Tanzania</p> <p>Country: Tanzania Area: 930 700 km² Population: 30 million, 32/km², 3.0% annual growth</p>



The project aimed at supporting the regional L&WMRP through training of senior and junior researchers, as well as other professionals and technicians engaged in relevant disciplines of land and water management. A number of short-term (2-3 weeks) in-service training activities were conducted between 1990 and 1994, and these included agro-meteorological data analysis and interpretation, Geographical Information Systems (GIS), land evaluation for land use planning, extension services, crop-water modelling, preparation and presentation of scientific papers, and soil moisture measurement techniques. The project also supported annual regional scientific conferences, which provided a platform for the SADC scientists to present papers whilst allowing them to become familiarized with new concepts, results and techniques. These activities were documented in reports that are available from SADC.

Through this programme, Zambia developed a wetlands-related soil and water management programme, which was eventually adopted as a regional programme, with specific modifications for national requirements. The funding for the programme was phased out in 1994 and since then very little has been reported as having been done from the member countries.

A number of international organizations that support the conservation and development of wetlands for agricultural purposes have initiated relevant programmes in the region. One of the mandates described in FAO's Constitution is the following: "The organization shall promote and, where appropriate, shall recommend national and international action with respect to: ... the conservation of natural resources and the adoption of improved methods of agricultural production ...". In this respect FAO has supported activities to improve the understanding of the regional situation concerning wetlands, and shared this information through workshops and meetings. Currently, the International Water Management Institute (IWMI) is involved in a study on the framework for a Comprehensive Assessment (CA) of the benefits, costs, and future directions of water management for agriculture.

The vision of the FANR Development Unit of SADC is to maintain the existing strategic alliances with the other sectors while at the same time ensuring overall responsibility for policy development, programme planning, management and coordination. The Unit has seven thematic areas of cooperation: agriculture, research and training; crop sector; livestock production and animal disease control; marine fisheries; inland fisheries; forestry; wildlife. The SADC Water Sector Coordination Unit (WSCU) and Environment and Land Management Sector (ELMS) are stand-alone sectors outside the FANR portfolio, but FANR cooperates with the WSCU in the area of green water and with the ELMS in the area of land use planning.

10.1.2.Environment related activities

During the last 6 years, the SADC-ELMS has organized a series of meetings and workshops to promote the development of Environmental Information Systems (EIS) in Southern Africa. These meetings and workshops have been organized in collaboration with a number of partners, such as UNEP, GTZ, USAID, IUCN, UNITAR and the Program on EIS in Sub-Saharan Africa.

Two formal sub-programmes were launched by SADC ELMS following recommendations of the third SADC EIS meeting, in Gaborone in June 1995. The training and education sub-programme is being implemented by the University of Botswana under an initiative called SETES (SADC ELMS EIS Training and Education sub-programme). The technical and networking sub-programme is being implemented by the SADC Food Security Technical and Administrative Unit (FSTAU) in Harare, Zimbabwe, through the SADC EIS Technical Unit (SETU).

SETU has taken a lead in pursuing the development of the EIS Network in the region, amongst others through a partnership with the IUCN's Regional Office for Southern Africa (IUCN-ROSA) and the India Musokotwane Environment Resource Centre (IMERSCA), both based in Harare, Zimbabwe. The three organisations formed teams that visited Lesotho, Malawi, Mauritius, Mozambique, Namibia, South Africa, Zambia, and Zimbabwe. Visits to Angola, Swaziland, and Tanzania are planned. The country visits focussed on the capacity-building and networking requirements for the development of a SADC-wide EIS. As a result of the findings of these visits, together with inputs from previous biodiversity and EIS meetings, a model detailing how an EIS network could work in SADC was developed. In addition the following three databases, were developed:

- ❖ **Sources Database:** electronic bibliography of source materials, publications, reports, etc. These sources will provide the basic information required by the SADC EIS and its various management system files. The database is being maintained and updated by SARDC for public and agency use throughout SADC and elsewhere
- ❖ **Contacts Database:** electronic Rolodex of individuals, institutions, and agencies. These contacts will be used when sourcing or servicing the SADC EIS and its national centres' data and information requirements. The database is being maintained and updated by SARDC for public and agency use throughout SADC and elsewhere
- ❖ **Geospatial Biodiversity Metadatabase.** The metadatabase represents the first of its kind in SADC, and will require further technological development before it can be widely accessed. The metadatabase is expected to be maintained and updated by SETU, who will provide public and government agency access through a common interface, such as the Internet, as well as the distribution of complete digital copies to national network partners

In order to link together a range of initiatives related to EIS development in the region, and to develop a joint programme of action, the fourth SADC EIS Workshop was held from 5 to 7 November 1997 in Pretoria, South Africa as a result of this partnership. It was organized jointly by the three partners

with considerable assistance from the Secretariat of the Programme on Environment Information Systems in Sub-Saharan Africa, based in Pretoria, South Africa. The objective of the meeting was to develop consensus on a way forward regarding the strategy for a Regional EIS Network and Capacity in the region, including biodiversity, and to formalize linkages between this SADC ELMS initiative and other relevant national, regional, and international EIS management and networking activities.

Some 40 participants from SADC countries attended the Workshop, in addition to representatives from SADC ELMS, SADC FSTAU, SADC FSTCU, UNEP, IUCN, IMERSCA, and the Programme on EIS in Sub-Saharan Africa. The proposed model for a SADC EIS network was discussed and working groups were formed to refine the model. Finally, the participants provided specific recommendations regarding the future development of the EIS network. In addition to this, participants representing National Focal Points met to discuss a number of priority activities, to ensure that momentum would be maintained and the national activities would become a fully integrated part of the Regional EIS Network. The following recommendations were adopted as being the key-actions to be included in the Workplan for SADC SETU, in collaboration with the National Focal Points and other members of the network:

- ❖ SADC SETU, as the coordinator of the SADC EIS Network, will ensure that the work programme will be implemented using all available capacity in the Region, and, where necessary, international expertise
- ❖ SADC SETU will contact, negotiate, and establish formal agreements with regional and international organizations, networks and initiatives regarding their role and work programme on EIS in SADC. These include amongst others: IUCN, IMERSCA, UNEP, World Bank, WRI, UNDP, etc.
- ❖ SADC SETU will continue to develop, in collaboration with the National Focal Points and other members of the network, a regional Meta-Database with information on existing databases in the region
- ❖ SADC SETU will encourage the development of national Meta-Databases
- ❖ SADC SETU will avoid the duplication of existing databases, but will identify shortcomings in collaboration with the National Focal Points, and find mechanisms to fill-up gaps
- ❖ SADC SETU will need to develop partnerships with existing national and regional institutions in the region, to make optimal use of regional capacity
- ❖ SADC SETU will develop a SADC EIS data and information policy, in collaboration with the National Focal Points and other SADC Sectors, ensuring the accessibility of data and information as well as the protection of intellectual property rights
- ❖ SADC SETU will develop a data pricing policy, in collaboration with the National Focal Points and other SADC Sectors. To the greatest extent possible, there should be a free flow of data, but where appropriate a discriminatory pricing policy can be applied according to national requirements
- ❖ National Focal Points and the National EIS Working Groups will work with SADC SETU to get EIS recognized as an important national and budgetary issue
- ❖ There are a variety of data formats in the region. SADC SETU should work with the National Focal Points to develop guidelines for the exchange of data
- ❖ SADC SETU should work with the National Focal Points and National EIS Working Groups to develop guidelines for regional classification schemes
- ❖ SADC SETU will establish a functional information delivery system by May 1998, which will include a Web-site and a Newsletter
- ❖ SADC SETU, as a matter of urgency, will develop a comprehensive work programme for the next 24 months, incorporating the above key-actions, a detailed budget, and a work plan

The information relating to how well these recommendations have been implemented to-date was not readily available.

10.2. Constraints to agricultural production in the SADC region

The whole region had a shift in the agricultural practices with the advent of the colonial era. The colonial administrations brought with them agricultural practices that reflected their experiences from European backgrounds and paid little attention to the traditional local systems. The drive was then to establish the 'new' practices and encourage or force the indigenous farmers to abandon their age-old practices, which were suddenly viewed as being "primitive". This approach had the effect of erasing a vital link between the traditional custodians of natural resources and the new policy-makers, who enforced the conservation of these resources from a different perspective. In all the SADC countries, there is evidence that wetlands (dambos) formed an important component in the livelihood strategies of indigenous communities. Settlements were located near such ecosystems, and communities used them for grazing, hunting, gathering, cultivation, and as water sources. Today, the highest population densities in Malawi are in wetland areas, and the prevalence of poverty tends to be highest in the same areas (FAO 1996). Invariably, wetlands, because of their capacity to retain moisture for prolonged periods, played a significant role in the food security of indigenous communities. Traditional communities successfully grew a variety of crops including vegetables, cereals, and root crops in dambos, which served as a 'safety-net' against droughts. Today, except in Mozambique and, to some extent Zambia where wetland use is not controlled, utilization of dambos for agricultural purposes by indigenous communities is, in most of SADC countries, restricted to the extent that food shortage at household level is a common occurrence.

The inherited policies on the utilization of wetlands/inland valleys (dambos) has taken a 'no-go area' attitude towards these ecosystems. This poses one of the major constraints to agricultural production in the SADC region. These prohibitive policies have discouraged research and development of wetlands, hence the lack of information in most countries. It should also be recognized that there is a dearth of information in respect to the management of these ecosystems, and as a result, policy-makers are not informed in respect of the potential of these ecosystems. This factor could be the major reason why there have been only limited efforts in all the SADC countries to realign policies in support of the utilization of wetlands for agricultural purposes, as was the case prior to colonial times.

In all the countries, smallholder farmers were shifted from areas of high agricultural potential to marginal areas, through the land redistribution exercises that took place with the advent of colonial administration. This type of land distribution is very distinct in Zimbabwe and South Africa, being the last bastions of the colonial system. This type of policy on land denied indigenous peoples access to land resources, which included wetland areas. Formation of reserved areas (Bantustans, Tribal Trust Lands, etc.) for the indigenous peoples of the SADC region resulted in overcrowding, which is one of the reasons for the degradation of the environment in these areas, including wetlands. Smallholder farmers, realizing the potential of wetlands in food production, continue to encroach through cultivation into these ecosystems, despite the existence of the restrictive legislative instruments (Zimbabwe and Malawi papers). On the other hand, whilst grazing of wetlands has been recognized as the recommended use for wetlands (dambos), the ecosystems have been seriously overgrazed, to the point that there is irreparable degradation in some of those within smallholder settlement areas.

10.3. Utilization systems for wetlands and their agricultural importance in the SADC region

The broad definition of wetlands that occur in this region includes riverine (river flood plains), palustrine (dambos), lacustrine (lakes and dams), marine, and estuarine systems. The theme of this paper however adopts the definition of the FAO Concept Paper (chapter 2), which is specifically aimed at the improved agricultural use and defines wetlands as being: “areas that have free water at or on the surface for at least the major part of the growing season. The water is sufficiently shallow to allow the growth of a wetland crop or of natural vegetation rooted in the soil” (Brinkman and Blokhuis, 1986). According to this definition, only the riverine and palustrine types of wetlands are included, and in this respect only the utilization systems applicable to these types of wetlands will be referred to.

10.3.1. Water supply: domestic and livestock supplies

Wetlands have played and continue to play a pivotal role in the supply of water for both domestic and livestock watering purposes for rural communities. Springs and shallow water tables facilitate the access of clean water through the digging of wells in the wetlands. Water from such springs and wells is less prone to water-borne diseases than river water, and this is important for the maintenance of good health in rural communities.

In all the SADC countries, these are the two uses that were not governed/restricted by any legislative instruments. The supply of water by wetlands in communal areas is, however, decreasing due to the degradation of these ecosystems.

10.3.2. Grazing: livestock production

In this paper, the use of wetlands for the grazing of livestock is considered as an important agricultural utilization system. This is one utilization system that has not been changed since time immemorial, except for the fact that the stocking rates have been excessively increased above sustainable levels in smallholder sectors due to inequitable settlement policies.

In all the countries, wetlands are used for grazing livestock in both commercial and smallholder sectors, and, in particular, they provide animal feed during the critical dry season when most of the herbage in the uplands is dry. In most areas and systems wetlands are grazed throughout the year, although the intensity is greater during the dry seasons. Some of the examples cited from the region serve to highlight the importance of wetlands in livestock production.

In Lesotho, wetlands of varying types and sizes are found within the rangelands, particularly in the highlands where sheep, angora goats, cattle, and horses form an important part of the local economy. The alpine and sub-alpine vegetation is usually subjected to heavy grazing pressure during the summer grazing season. The livestock tends to congregate on wetlands, where the vegetation is more palatable than the surrounding areas. In addition, the wetlands generally provide high quality forage during the critical autumn and spring/early summer periods, when the surrounding grassland is dry (Grab and Morris 1997). This pressure has resulted in serious damage to many wetlands in Lesotho. Trampling by large livestock is the main cause of wetland degradation while small livestock, such as sheep, make little contribution to the destruction of the wetlands

Malawi is not self-sufficient in beef production, and current sources of animals are either located or mostly grazed in wetlands. Wetlands are important grazing areas primarily because: a) they have very high primary production due to the prolonged growing season; b) they have plant food values with higher water content; c) most grasses are palatable and luxuriant; d) water is abundant and available.

In South Africa and Zimbabwe, the larger proportion of wetland areas suitable for agricultural purposes are in commercial farming areas. The greater percentage of these is used for grazing of livestock and game. Being under private ownership and by a few individuals, the grazing is rotational and the wetlands are in sound condition. In the smallholder communal areas, on the other hand, greater numbers of livestock units are concentrated in smaller areas and overgrazing of wetlands is the norm. This has resulted in excessive damage of wetlands, being caused through soil erosion and hoof action. The feed base is generally degraded and animal condition is poor, resulting in lower meat and milk yields and lack of draught power for tillage purposes.

Although in Swaziland no information exists to show that wetlands are used for livestock grazing, it is common knowledge that some dambos are used for this purpose (country paper). In Zambia, the *vertisols* and *fluvisols* of the Zambezi and Kafue rivers support cattle grazing under traditional systems in Zambia. The flood plain grasses are usually of better quality than upland grasses. The wetlands are particularly suitable for grazing of cattle in the dry season, because of the availability of grass and its high regeneration potential due to the prevalence of water (country paper).

Except for a few limited cases in the commercial sectors in South Africa and Zimbabwe, where nutritious species have been planted in wetlands, there are few examples where wetlands have been developed for purposes of improving pasture quality. This is despite the important contribution of these ecosystems to the provision of feed and water to the millions of livestock animals in the region.

10.3.3. Cultivation

As indicated earlier, traditional farmers in the SADC countries cultivated wetlands intensively before colonial times. Writings and accounts by European travelers of earlier times bear witness to the successful production of crops from wetland cultivation in the region (Sawer, 1909). Crops that included rice, vegetables, roots and tubers, melons, millets, and maize were reported to have been grown in wetland areas and marketed to European settlers.

Available evidence in Zimbabwe shows that traditional farmers made ridges (Whitlow, 1984; Mharapara, 1995) in wetlands, onto which they planted and grew upland crops successfully, despite waterlogged conditions in the surrounding areas. The widespread practice of ridging, even in the upland arable areas in Malawi today, may be the carry over of such a cultivation system. Wetland cropping ensured successful harvests because of the available water and good soil fertility parameters that are characteristic of wetlands. This provided a buffer against crop failures due to droughts.

The enactment of restrictive legislation in SADC countries banned the cultivation of wetlands for the majority of indigenous communities, and most of them resorted to the use of marginal areas of the wetlands. Traditional methods were discouraged and, instead, the upland areas (catchments) were cleared and intensively tilled through the use of the newly introduced ox-drawn plough. Despite these changes, a few farmers, driven by need and the realization of the potential in wetlands for food production, encroached on these areas with cultivation. A considerable number were arrested for such activities (Maseko, 1995) and only a few were given permission to continue.

Country situations, drawn from the country papers, highlight the different scenarios in the member countries of SADC in respect of the level of cultivation, and its importance to those communities.

The government policy, as implemented by the service institutions, is very strict against the cultivation of wetlands in Lesotho, and such practice is further constrained by the steep terrain of the land surface. Very little wetland cultivation occurs around marshes and it is reported that as farmers gradually encroach on the marshes so they dry up (country paper). The pressure for cultivable land is

increasing in Lesotho, as evidenced by the decline of arable land from 13 percent in 1966 compared to the current 9 percent of the total land area at present.

In Malawi, the cultivation of vegetables, maize, sweet potatoes, beans, and sorghum in wetlands (*dimbas*) is very important to rural communities. Residual moisture utilisation in the Lower Shire marshes and fringes is significant in agricultural production in the Shire Valley ADD, to the extent that winter maize crop is more significant than the wet season upland crop. The floodplains are very important for the growing of rice. Approximately 88 percent of the documented rice area in Malawi is in wetlands and utilized under rain-fed conditions (Kumwenda 1997). Despite these activities and the enormous importance attached to wetlands, large areas of wetlands in the country have not shown their full potential of diversified utilisation. And, most importantly, no proper management and utilization system has been put in place, despite the existence of more than 118 000 ha of wetland area irrigated by traditional methods. Such methods are viewed as being labour intensive and inefficient and yet there are no alternatives. Most farmers living in and around wetlands fall in the category of poor or very poor farmers (FAO, 1996; Mzembe, 1997). In 1996 a study of 16 dambo sites in Lilongwe, Kasungu, and Mzuzu ADD showed that cultivation of dambos amounted to about 20 percent of the area.

Of the 36 million ha cultivatable land in Mozambique, estimates indicate that agricultural wetlands represent approximately 16 percent. There is limited information as to the level of wetland cultivation in this country, although it is known that this is practiced by rural communities.

South Africa is the one SADC country that has, until very recently, promoted commercial cultivation of wetland areas whilst ignoring smallholder farmers. Extensive wetland areas have been developed as commercial cropland in South Africa, most of this taking place in the white commercial sector prior to the 1980s and with government support in the form of advice (Hill *et al.* 1981) and subsidies (Kotze *et al.* 1995).

Crops that include sugar cane, taro, wheat, oats, planted pastures, and maize are grown, with the crop types varying according to wetland region. Agriculture is a generator of wealth and constitutes one of the key industries in the country's economy. The position of agriculture not only concerns the farmer, urban areas, and secondary manufacturing, but because of its inputs and outputs and its function as an employer, it also has a profound impact on the entire economy. Agriculture provides for basic human needs and it is a prerequisite for acceptable economic, political and social order as well as for the general stability of society. It is furthermore estimated that in South Africa six million people are dependent on agriculture for a livelihood.

For the 17 million rural dwellers, the incidence of malnutrition in children under five has been estimated at 60 percent, and at the beginning of this decade between 30 000 and 50 000 South Africans were dying of hunger-related diseases. More than anyone else, the rural poor are often very dependent on wetlands and their life-support functions. Wetlands provide rural communities with water, food, fibre, and a buffer against drought. Despite this, in South Africa's communal rural areas, wetlands have received very little attention from conservation and development organizations.

Smallholder cultivation remains project based, very limited, and without state support. In the cited area of Mbongolwane wetland, KwaZulu-Natal, about 10 percent of the wetland is currently used for cultivating crops. The most widely grown are madumbes (*colocacia*), a traditional Zulu crop that can tolerate temporarily or seasonally waterlogged conditions and is commonly grown in ikhwane marsh. This unique project, facilitated by the LandCare Programme, involves strengthening the management of the wetland, protecting the sensitive areas, natural resource conservation (sustainable harvesting of reeds, controlled grazing and burning), sustainable agriculture (ecologically-sound agricultural practices: awareness of negative impact of chemical agricultural inputs), organic production of

vegetables and crops for commercial purposes, eco-tourism, and grazing management systems (herding, alternative feeds and animal health systems).

In recent years, South Africa has changed its policy on wetlands development from one that promoted commercial agriculture on wetlands to one that emphasizes conservation of these ecosystems for reasons of reducing degradation. All wetland areas that were put under cultivation are now considered as having been destroyed or lost. Examples of these areas and levels of development or “loss” include the upper Mgeni catchment, where 49 percent of the wetland area has been developed for agriculture and a further 17 percent lost to other land use activities (Kotze, 1999). In the Mfolozi catchment, 58 percent of the wetland area has been lost to erosion, cultivation, and other forms of development (Begg, 1988). Although Begg (1989) did not estimate the extent of cropland, 51 percent of the wetlands in Mfolozi catchment were found to have croplands within them. In the Sand River catchment, Mpumalanga, high levels of agricultural development are also encountered, owing particularly to the recent expansion of taro cultivation (*personal communication by M. Braak, Mondi Wetland Project, to Donovan Kotze*). Water pollution and soil erosion are now being flagged as the widespread problems. Thus, the conservation of wetlands is seen as a very high priority, and any benefits gained by increasing the agricultural production from wetlands need to be weighed up against potential impacts on the wetland functions that help to mitigate the threats to human well-being (*personal communication by J. Dini, Department of Environmental Affairs, to Donovan Kotze*).

One of the observations regarding the wetland development in South Africa is that in the earlier phases inequitable policies favoured and promoted wetland cultivation in the commercial sector, whilst it restricted smallholder farmers, who were made to depend on the former. The method of cultivation used, however, did not take cognizance of the traditional systems, as it promoted wetland drainage and hence was not sustainable. In recent times, there appears to have been an awakening call in respect to the hydrological damage being caused by this system, and the reaction is taking a focus on conservation and wanton restrictions on cultivation. This is a repeat of the Zimbabwean case of the 1930s where inequitable policies on wetland utilization were promoted and the favoured group came to use practices that threatened the environment with destruction. Policy-makers then responded by enacting restrictive legislation that exists to this day.

In Swaziland and Tanzania, there was no sufficient information to indicate the level of wetland cultivation, although the country papers acknowledged such utilization systems in the countries.

In Zambia, *dambos* are important for the cultivation of both agronomic and horticultural crops, including cassava, rice, maize, sorghum, millet, beans, groundnuts, vegetables, sweet potatoes, bananas, mangoes, and citrus fruits. The *gleysols* of the Zambezi flood plain and the Chambeshi basin support paddy rice. Difficulties in growing rice in the Zambezi floodplains restrict it to the edges of the plain. The *vertisols* of the Kafue flats support large-scale sugar production. In the lower section of the flats the use of fertilizers, especially on sugarcane production, has led to eutrophication of part of the river. The *calcic vertisols* of the Lukanga swamps support limited cropping. Large-scale maize cultivation is limited to higher grounds surrounding the swamp. Declining food production due to droughts would necessitate an increase in wetland agriculture and development of infrastructure.

Wetland cultivation in Zimbabwe is restricted by legislation and, officially, is only allowed after a special permit has been issued by the Natural Resources Board. The Board has overall responsibility for natural resources and monitors the enforcement of the regulations. On the ground however, farmers encroaching wetlands with cultivation have committed a number of violations of these rules and a number have been penalized for so doing. Some have, however, been granted permits and allowed to cultivate these areas. A familiar view in wetlands within communal areas is a series of bush-fenced

vegetable gardening areas running the length of the dambo margins. In some areas upland fields are seen extending or jutting into the wetland areas, to include wetland soils. Crops generally grown include maize, rice, vegetables, bananas, tsenza (*esculentus*), madhumbe (*Colocacia*), cucumber, and melons. These crops make a significant contribution towards household food security and are often important in raising household income through the marketing of excess produce. In all areas throughout communal rural Zimbabwe, a cultivatable wetland area is considered prime land, and a desired opportunity that every rural family would want to have for purposes of food production.

In six communal areas in Zimbabwe, six respective villages are cultivating wetlands using the newly developed “Ngwarati Cultivation System”, based on broad ridges and furrows across the wetlands (chapter 12). The system was developed through research that showed that wetlands can be cultivated safely and productively for the benefit of communities. It has shown that value of the ecosystems, in the eyes of the resident communities, can be increased, and that its spread is being demanded by other communities who have been exposed to it. Zimbabwean researchers and development agents expect to have the policy reviewed, based on the information and observations from this research.

10.4. The potential impact of wetlands on agriculture within the SADC region

The SADC region has climatic conditions that range from desert conditions in Namibia to tropical savannah in Malawi, and a Mediterranean type of climate in the Cape in the extreme south. Rainfall amounts range from less than 100 mm in the driest regions through to more than 2 000 mm in the highlands of Malawi. The common feature that transcends the different climatic conditions, irrespective of the rainfall amounts, is the occurrence of unpredictable soil moisture stress during the growing seasons, which is attributed to the erratic rainfall patterns and droughts associated with the regional climate.

The climatic conditions broadly outlined above have the net effect of constraining agricultural production, since lack of rainfall negatively affects availability of surface water for both domestic and livestock watering, soil moisture for plant growth, and shortening of the growing season. Low crop yields, crop failures, poor animal condition, malnutrition, and poverty are all very common features within smallholder agricultural communities throughout the SADC countries. A close scrutiny of the underlying cause for this points at the limited water and low soil fertility encountered by farmers in their cropping systems. The upland fields and rangelands are prone to water runoff and in-season droughts, resulting in poor crop and herbage growth and, hence, yields.

Wetlands are the natural collection points for the water harvested by the surrounding catchment areas and remain moist even when all the other areas have since dried. The runoff from the catchment areas brings with it nutrients and silt collected along the way, which serves to enrich the wetland areas where it is deposited (Mharapara, 1995). This deposition also serves to clean off and make available to plants and crops the solutes and debris that would contaminate and clog the water bodies downstream. For this depositional process to take place runoff must be slowed down by obstructions (grasses, crops, sedges, structures, terrain, etc.), which have an added advantage of preventing flash floods in the drainage systems.

Utilization of these ecosystems for agricultural purposes allows farmers to take advantage of the reliable supply of water and soil fertility that are characteristic of these ecosystems. This results in increased and stable production levels, translating into increased food security and better livelihoods for the resident communities. Wetland degradation from cultivation, which is often flagged as the

justification for prohibiting such practices, can be avoided as long as the natural hydrologic dynamics are respected and accommodated within the tillage system. Research work by Mharapara (1995) has shown that wetlands (dambos) can be cultivated safely using the Ngwarati Cultivation System. The system also has the potential to rehabilitate degraded wetlands.

The potential for increased sustainable production from cultivated wetlands has been demonstrated in Zimbabwe. Crop yields that are five to ten fold the levels that are generally achieved in the surrounding upland fields have been harvested in the six pilot sites established in Zimbabwe. It does not require a genius to figure out the potential impact of cultivating wetlands upon the livelihoods of rural communities at this level of production enhancement. In pre-colonial times, wetland cultivation was a tradition amongst the indigenous communities, which ensured their food security and well-being.

10.5. Suggested issues for the way forward

From a bird's eye view of the region, the following observations could be summarized:

- ❖ There are widespread food shortages particularly at household levels, in rural communities
- ❖ The attitude to the utilization of wetland resources has been biased by incoming administrations towards conservation, at the expense of the livelihood strategies for indigenous communities
- ❖ Indigenous knowledge systems and management strategies of these ecosystems have been neglected and discouraged, despite the fact that they appeared to be more appropriate and sustainable
- ❖ Whilst superfluous environmental policies have been engaged in all SADC countries there is a lack of appropriate and specific policies designed by informed sources that would address the real issues of wetland development
- ❖ Agriculture remains the backbone of the majority of SADC countries, yet there are signs of continued decline in production in the face of increasing populations and poverty
- ❖ The voice of the resident rural communities in their bid to access the wetlands for cultivation is generally being ignored and often stifled by insensitive policies, ones based and designed on parallel values to those of these custodians
- ❖ Wetland utilization for agricultural purposes presents the most appropriate opportunity for increasing productivity and improvement of rural livelihoods in the region
- ❖ Wetland cultivation has the potential to facilitate diversification in agricultural production within rural communities

Drawing from the observations that are constraining the utilization of wetlands for agricultural purposes, together with the information that exists on the opportunities for improving the situation, the following suggestions for the way forward should be presented for consideration:

- ❖ There is need to raise consciousness amongst policy makers, and the need to re-examine environmental policies and, in particular, develop those pertaining to wetland management and utilization, at both national and regional levels
- ❖ Policies should be developed through consultative and participatory dialogue between policy makers and users, at all levels, in order to ensure their relevance and appropriateness
- ❖ Research and development on the utilization and management of wetlands should seriously take into consideration those indigenous knowledge systems upon which they can improve
- ❖ Capacity-building of policy makers, service providers (institutions and individuals), and communities to improve skills, knowledge, appreciation, and vision is critical within the region, if there is to be progress in this field

- ❖ There is also an urgent need to develop information management systems that would allow the sharing of existing and new information, and the skills and technologies that enhance the management of wetlands in the region. Regional and international organizations such as SADC, FANR, WSCU, ELMS, FAO, IWMI, IUCN, IFAD are in a position to encourage such developments based on focused and coordinated regional activities
- ❖ Wetland cultivation holds the potential to bring about a sustainable agricultural production revolution in the region, and over a relatively short period. At the same time, cultivation of wetlands has the potential for high environmental impacts, ultimately having a negative effect on the livelihoods of local communities. In some parts of the region there exist extensive areas of wetland with good potential for cultivation. However, in other areas, the natural extent of wetlands is very limited, wetlands being inherently too sensitive for cultivation (e.g. Lesotho Highlands), or the proportion of wetlands developed is already very high (e.g. KwaZulu-Natal Midlands, South Africa), leaving little scope for expanding the extent of wetland cultivation. Therefore, the situation in the catchment and broader landscape should be considered when promoting any further development of wetlands in an area

10.6. Conclusions

Wetlands are, undoubtedly, an integral component of the production base for rural communities, and in that respect contribute significantly to their livelihoods. They are important in that they provide water for domestic use and animal watering, crop and fodder production, and habitats for a variety of flora and fauna that are valuable to communities. Moreover, they are a vital part in the hydrological continuum of the catchment-drainage system.

The region is faced with chronic problems in respect of food shortages, poverty, and poorly performing economies. The management of the natural resources, and wetlands in particular, has been largely ignored, and where this is attended to, conservation without utilization is considered the panacea. Unfortunately, this approach lacks the participation of the resident communities who are, in essence, the custodians and beneficiaries of the resources. It is observed that wetland development for agricultural purposes would increase and stabilize agricultural production and for the betterment of these communities. Such a development would raise the perceived value of these ecosystems by the communities, which would act as a strong incentive for conservation.

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PART III

Other technical presentations

Wetland development and management in Zimbabwe: Seke research programme

***PowerPoint presentation given by Isiah Mharapara
Agricultural Research Council, Zimbabwe***

The presentation on wetland development in Zimbabwe summarized some of the research work done on the development of wetland cultivation systems in Zimbabwe. Zimbabwe, like most of the SADC countries, has legislation that restricts the cultivation of wetlands. Such pieces of legislation were put in place in the early 1920s and 1950s and tend to be poorly informed by research. The research that was then initiated aspired to gather scientific information that would either support the legislation or challenge its basis. The presenter indicated that traditional communities did cultivate wetlands successfully before the colonial era and this prompted him to investigate the development of safer systems guided by the traditional practices and methods. The “Ngwarati cultivation system” that has been developed over a period of 19 years has been shown to be safe, stable and offering rural communities an opportunity to enhance their food security.

Development of a Wetland (*Dambo*) Cultivation System in Zimbabwe



I.M. Mharapara

Agricultural Research Council, Harare, Zimbabwe

Development of a Wetland (*Dambo*) Cultivation System in Zimbabwe

1. Introduction

2. Conceptual development: from research station to Communal Lands
3. Experiments on the Communal Lands
4. Evaluation of the experimental programme
5. Recommendations
6. Conclusions

Development of a Wetland (*Dambo*) Cultivation System in Zimbabwe

1. Introduction

- | | |
|--|---|
| 2. Conceptual development: from research station to Communal Lands | ❖ Occurrence/Distribution |
| | ❖ Traditional wetland utilisation |
| 3. Experiments on the Communal Lands | ❖ Current legal status of wetlands |
| 4. Evaluation of the experimental programme | ❖ Rationale for research and development of wetlands |
| 5. Recommendations | |
| 6. Conclusions | |

Development of a Wetland (*Dambo*) Cultivation System in Zimbabwe

1. Introduction

- | | |
|--|--|
| 2. Conceptual development: from research station to Communal Lands | ❖ Traditional wetland utilisation |
| | • Water source – (settle) |
| 3. Experiments on the Communal Lands | • Livestock grazing |
| | • Hunting |
| 4. Evaluation of the experimental programme | • Gathering fruits, etc. |
| | • Medical plants |
| 5. Recommendations | • Basketry, pottery, etc. |
| 6. Conclusions | • Cultivation |

Development of a Wetland (*Dambo*) Cultivation System in Zimbabwe

- | | |
|--|---|
| <ol style="list-style-type: none"> 1. Introduction 2. Conceptual development: from research station to Communal Lands 3. Experiments on the Communal Lands 4. Evaluation of the experimental programme 5. Recommendations 6. Conclusions | <ul style="list-style-type: none"> ❖ Current legal status of wetlands <ul style="list-style-type: none"> • Non-arable grazing areas • Common property in communal areas ❖ Background to policy <ul style="list-style-type: none"> • Power shift in colonial era • Separate development policy • Communal area establishment • <i>Dambo</i> inappropriate management and misuse → degradation and siltation of water systems • Restrictive legislation |
|--|---|

Development of a Wetland (*Dambo*) Cultivation System in Zimbabwe

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|--|---|
| <ol style="list-style-type: none"> 1. Introduction 2. Conceptual development: from research station to Communal Lands 3. Experiments on the Communal Lands 4. Evaluation of the experimental programme 5. Recommendations 6. Conclusions | <ul style="list-style-type: none"> ❖ Rationale for research and development of wetlands <ul style="list-style-type: none"> • Current degradation • Lack of sound management information • Communities depend on them • Potential for increased diversity (crops, animals) • Environmental considerations |
|--|---|

Development of a Wetland (*Dambo*) Cultivation System in Zimbabwe

1. Introduction
- 2. Conceptual development: from research station to Communal Lands**
3. Experiments on the Communal Lands
4. Evaluation of the experimental programme
5. Recommendations
6. Conclusions

Development of a Wetland (*Dambo*) Cultivation System in Zimbabwe

- | | |
|---|---|
| 1. Introduction | ❖ Identification of need (rice – survey) |
| 2. Conceptual development: from research station to Communal Lands | ❖ Systems expectations |
| 3. Experiments on the Communal Lands | – Prevent soil erosion |
| 4. Evaluation of the experimental programme | – Preserve soil moisture and free water |
| 5. Recommendations | – Maintain soil fertility |
| 6. Conclusions | – Increase productivity and value of resource |
| | – Improved livelihoods |
| | ❖ Experiments: tillage, crops, etc. |

Development of a Wetland (*Dambo*) Cultivation System in Zimbabwe

- | | |
|--|--|
| 1. Introduction | Methodology: monitored farmer-led experimentation |
| 2. Conceptual development: from research station to Communal Lands | Results: |
| 3. Experiments on the Communal Lands | – Creating the managed wetland |
| 4. Evaluation of the experimental programme | – Crop yields and reliability |
| 5. Recommendations | – Catchment hydrology and sediment reduction |
| 6. Conclusions | – Soil fertility management |
| | – Socio-economic considerations |

Development of a Wetland (*Dambo*) Cultivation System in Zimbabwe

- | | |
|--|---|
| 1. Introduction | <i>Methodology used: monitored farmer-led experimentation – the new site at Wedza</i> |
| 2. Conceptual development: from research station to Communal Lands | |
| 3. Experiments on the Communal Lands | |
| 4. Evaluation of the experimental programme | |
| 5. Recommendations | |
| 6. Conclusions | |



Development of a Wetland (*Dambo*) Cultivation System in Zimbabwe

Creating the managed wetland

1. Building the stream outflow and gauging station at Shurugwi

1. Introduction
2. Conceptual development: from research station to Communal Lands
- 3. Experiments on the Communal Lands**
4. Evaluation of the experimental programme
5. Recommendations
6. Conclusions



Development of a Wetland (*Dambo*) Cultivation System in Zimbabwe

Creating the managed wetland

2. Finishing off the ridges and furrows at Wedza

1. Introduction
2. Conceptual development: from research station to Communal Lands
- 3. Experiments on the Communal Lands**
4. Evaluation of the experimental programme
5. Recommendations
6. Conclusions



Development of a Wetland (*Dambo*) Cultivation System in Zimbabwe

1. Introduction
2. Conceptual development: from research station to Communal Lands
- 3. Experiments on the Communal Lands**
4. Evaluation of the experimental programme
5. Recommendations
6. Conclusions

Yields of maize (t/ha) at Seke and Gutu

Site	1995/6	1996/7	1997/8
Seke – Average	5.88	3.58	3.31
Seke – Range	2-10	2-6	2-7
Gutu – Average	-	5.59	5.24
Gutu – Range	-	3-10	4-7

Development of a Wetland (*Dambo*) Cultivation System in Zimbabwe

1. Introduction
2. Conceptual development: from research station to Communal Lands
- 3. Experiments on the Communal Lands**
4. Evaluation of the experimental programme
5. Recommendations
6. Conclusions

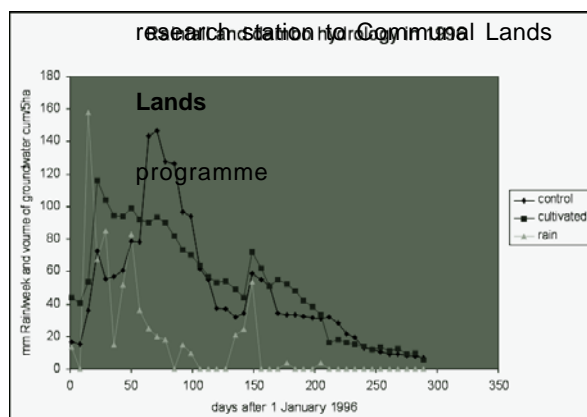
Yields of rice (t/ha) at Seke and Gutu

Site	1995/6	1996/7	1997/8
Seke – Average	2.85	2.26	2.42
Seke – Range	2-3	1-3	2-3
Gutu – Average	-	3.0	1.28
Gutu – Range	-	1-6	1-2

Development of a Wetland (*Dambo*) Cultivation System in Zimbabwe

1. Introduction
2. Conceptual development: from research station to Communal Lands
- 3. Experiments on the Communal Lands**
4. Evaluation of the experimental programme
5. Recommendations
6. Conclusions

Catchment hydrology and sediment reduction



Development of a Wetland (*Dambo*) Cultivation System in Zimbabwe

1. Introduction
2. Conceptual development: from research station to Communal Lands
- 3. Experiments on the Communal Lands**
4. Evaluation of the experimental programme
5. Recommendations
6. Conclusions

Methodology: monitored farmer-led experimentation

Results:

- Creating the managed wetland
- Crop yields and reliability
- Catchment hydrology and sediment reduction
- Soil fertility management
- Socio-economic considerations

Development of a Wetland (*Dambo*) Cultivation System in Zimbabwe

1. Introduction
2. Conceptual development: from research station to Communal Lands
- 3. Experiments on the Communal Lands**
4. Evaluation of the experimental programme
5. Recommendations
6. Conclusions

Socio-economic considerations – meeting at Sadza to discuss community development



Development of a Wetland (*Dambo*) Cultivation System in Zimbabwe

1. Introduction
2. Conceptual development: from research station to Communal Lands
3. Experiments on the Communal Lands
- 4. Evaluation of the experimental programme**
5. Recommendations
6. Conclusions

- ❖ Food security
- ❖ Dietary quality
- ❖ Marketing surpluses

Development of a Wetland (*Dambo*) Cultivation System in Zimbabwe

1. Introduction
 2. Conceptual development: from research station to Communal Lands
 3. Experiments on the Communal Lands
 4. Evaluation of the experimental programme
 5. **Recommendations**
 6. Conclusions
- ❖ **Further development approach**
 - ❖ **Policy changes concerning *dambos***
 - ❖ **Further research needed**

Development of a Wetland (*Dambo*) Cultivation System in Zimbabwe

1. Introduction
 2. Conceptual development: from research station to Communal Lands
 3. Experiments on the Communal Lands
 4. Evaluation of the experimental programme
 5. **Recommendations**
 6. Conclusions
- ❖ **Further development approach**
 - **The big picture plan**
 - **Making farmer the central partner**
 - **Institutional coordination**
 - **Training (technical, organisational, marketing, etc.)**
 - **Multi-disciplinary teams**
 - **Appropriate machinery**
 - **Marketing and processing of produce**

Development of a Wetland (*Dambo*) Cultivation System in Zimbabwe

- | | |
|---|---|
| <ol style="list-style-type: none"> 1. Introduction 2. Conceptual development: from research station to Communal Lands 3. Experiments on the Communal Lands 4. Evaluation of the experimental programme 5. Recommendations 6. Conclusions | <ul style="list-style-type: none"> ❖ Policy changes concerning <i>dambos</i> <ul style="list-style-type: none"> – Review of available information – Policy makers (all levels) – Institutional involvement and commitment (Extension, suppliers, farmers' organisations, etc.) – Guidelines – Enforcement (quality control) |
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Development of a Wetland (*Dambo*) Cultivation System in Zimbabwe

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|---|--|
| <ol style="list-style-type: none"> 1. Introduction 2. Conceptual development: from research station to Communal Lands 3. Experiments on the Communal Lands 4. Evaluation of the experimental programme 5. Recommendations 6. Conclusions | <ul style="list-style-type: none"> ❖ Further research needed ❖ Technical <ul style="list-style-type: none"> – Land preparation – Water management – Fertility (nutrient mobility, toxicity, deficiency) – Soil condition ❖ Socio-economic <ul style="list-style-type: none"> – Use of common property – Drivers to beyond mere subsistence |
|---|--|

Development of a Wetland (*Dambo*) Cultivation System in Zimbabwe

Farmers delighted with their crop at Gutu

1. Introduction
2. Conceptual development: from research station to Communal Lands
3. Experiments on the Communal Lands
4. Evaluation of the experimental programme
5. Recommendations
- 6. Conclusions**



Understanding dambo hydrology: Implications for development and management

Presentation given by Matthew McCartney

Centre for Ecology and Hydrology, Wallingford, United Kingdom

Abstract

Wetlands provide an important water reserve and so are vital for the livelihoods of many small-scale farmers in southern Africa. However, if wetlands are to be used in a sustainable manner, it is necessary to determine their vulnerability to change resulting from human activities. Knowledge of hydrology and quantification of water inputs and outputs are pre-requisites to successful management of wetland ecosystems. This paper describes an investigation to provide insight into the hydrology of dambos. The implications of the study findings for agriculture and water resource management in the SADC region are discussed. A practical application of the study results – to estimate the number of treadle pumps that can be safely used in a dambo – is presented.

13.1. Introduction

Dambos, seasonally saturated wetlands, are important elements of the landscape over much of southern Africa. They are important for the food security of many people because they provide a water reserve that can be used in the dry season and during times of drought (Scoones, 1991). In many countries in southern Africa rapid population growth has led to increased utilization of dambos by small-holder farmers, and increasingly simple technologies such as treadle pumps are being used to facilitate irrigation.

Dambos are also attributed an important role in the regional hydrological cycle. It is widely believed, though not scientifically substantiated, that they act as “sponges” or reservoirs, storing water in the wet season and releasing it slowly in dry season, thus attenuating floods and maintaining dry season river flows.

In Zimbabwe, where it is estimated that they occupy about 1.3 million ha (i.e. close to 4 percent of the country’s area), small-scale farmers have always depended on dambos for crop production (Whitlow, 1985). However, for much of this century their disturbance, through cultivation, has been perceived to conflict with their function as a source of downstream river flow. Indeed, colonial legislation (e.g. the Water Act, 1927 and the Natural Resources Act, 1941) sought to prevent dambo cultivation in order to protect downstream water resources (Bullock, 1992).

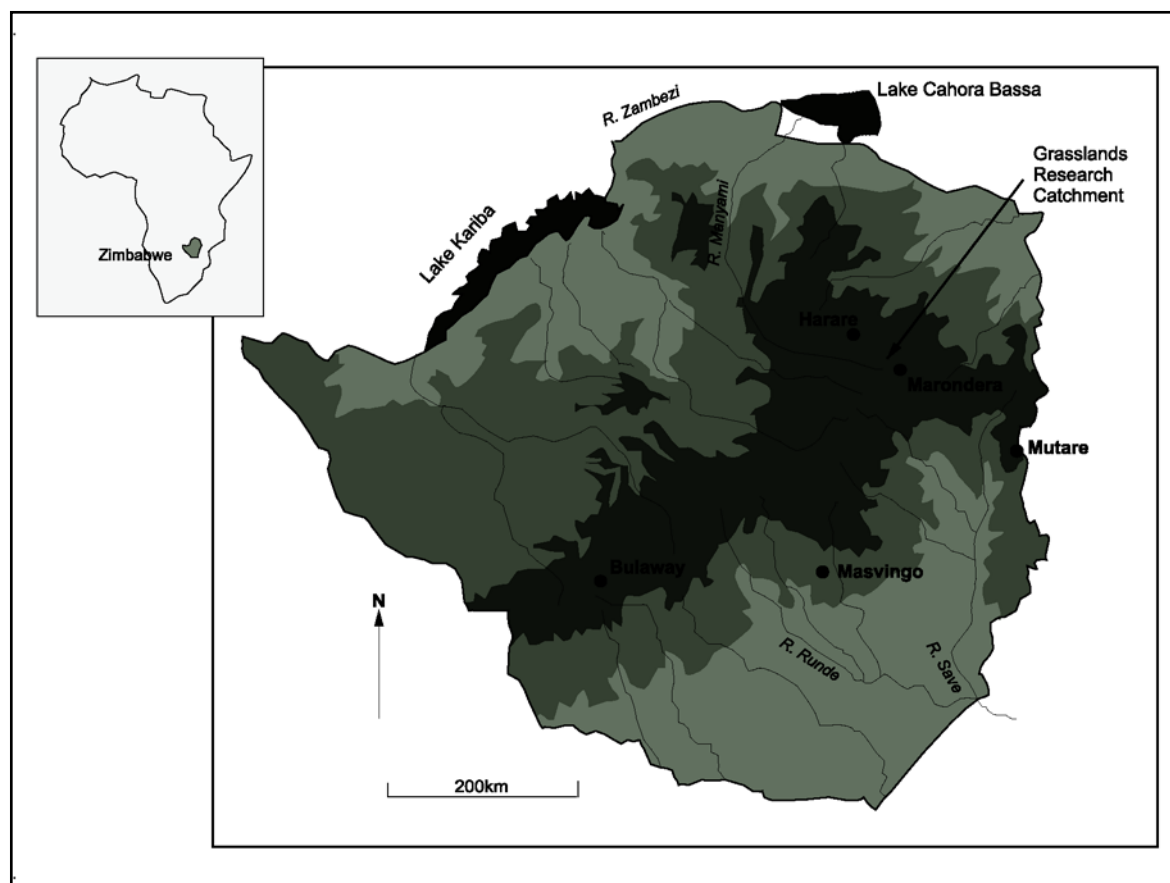
At present, detailed understanding of the hydrological processes occurring within dambo catchments is lacking. A review of hydrology in southern Africa reveals that much that has been written about their hydrological functions is based on conjecture rather than rigorous scientific evidence (McCartney, 1998). Dambos are, therefore, worthy of scientific interest in relation to both process understanding and environmental management.

13.2. The dambo processes integration experiment

The Dambo Processes Integration Experiment, conducted between 1994 and 1998, involved detailed monitoring of a small catchment at the Grasslands Research Station at Marondera in Zimbabwe (Figure 2). Located in a predominantly grassland region, it is typical of many parts of the Zimbabwean highveld (i.e. land at altitude $> 1200\text{m}$). Catchment relief is low, with slopes less than 4 percent and altitude ranging from 1654 to 1611 metres above sea level. The catchment area is 3.33 km^2 . The catchment comprises an upland (i.e. interfluve) region 2.12 km^2 in area, and a dambo 1.21 km^2 in area (i.e. 36 percent of the catchment). A distinct catena exists that is typical of many catchments containing dambos. The interfluve soils are moderately deep, coarse to medium-grained sandy loams overlying sandy clay loams. The dambo soils are hydromorphic, with topsoils that are high in organic matter. At shallow depth, across the dambo, there is a well-defined kaolinitic clay wedge. The vegetation changes in character from the interfluve to the dambo. On the interfluve, there are areas of indigenous miombo woodland (e.g. *Brachystegia speciformis*) and dryland grasses (e.g. *Hyparrhenia filipendula*). On the dambo, various species of grass (e.g. *Sporobolus subtilis*) and sedges predominate. The catchment is used primarily for light cattle grazing but there is some cultivation of maize. Annual rainfall varies considerably but the long-term average (1956 to 1995) is 859 mm. Rainfall occurs predominantly during the summer (October to March) whilst the winter months (April to September) are usually dry. Average annual potential evapotranspiration is 1700 mm.

Long term meteorological and flow data are available for the site. Flow has been measured at a weir at the catchment outlet since 1956 and there has been a meteorological station within 1.5 km of the catchment since 1953. During the Dambo Processes Integration Experiment additional data collected

Figure 2
Location of the grasslands research catchment



over a two-year period (October 1995 to September 1997) included catchment rainfall (from 5 raingauges located within the catchment) and soil water content and groundwater levels along an instrumented transect across the catchment. Additional data on geochemical tracers (e.g. chloride and alkalinity) and isotopes (e.g. deuterium), that are naturally present in water, were also collected. The combined data sets were analyzed to examine the catchment water balance, hydrological pathways and stream flow generating processes (McCartney 1998).

13.3. Key study findings

The key findings from the experiment were:

- ❖ The hydrology of the catchment is heavily influenced by the clay lens embedded at shallow depth within the soil profile of the dambo. The clay acts as a barrier, separating the below-clay and above-clay water bearing layers. The soil profile over much of the dambo may be saturated for several months in the wet season because vertical drainage is impeded by the clay while the low slope angle reduces throughflow efficiency.
- ❖ Flow from the catchment is seasonal (i.e. the stream never flows all year). The greatest discharge from the catchment occurs when the soil profile across the dambo is saturated (i.e. January to March). Frequency analysis highlights the very "flashy" nature of flow from the catchment. During 1995/96, two-thirds of the total annual discharge occurred on just 15 days out of the 269 with flow (McCartney *et al.* 1998).
- ❖ The stream may continue to flow well into the dry season; during 1995/96, it continued until 9 September 1996, but this late season flow accounted for less than 6 percent of the total annual runoff. Temporal variation in stream chemistry is consistent with the interpretation that all flow from the catchment, including the dry season recession, is derived predominantly from shallow sources without significant augmentation from a deep "bedrock" aquifer (McCartney and Neal, 1999).
- ❖ Groundwater inflow from the interfluvium into the dambo is only a small proportion of the total water input to the dambo over the year, the remainder being direct rainfall. During 1995/96, the inflow from the interfluvium was estimated to be just 12 percent of the total. Most (80 percent) of this occurred during the wet season.
- ❖ Considerable volumes of water (240–125 mm) are stored above the dambo clay lens at the end of the wet season. However, dry season flow typically comprises less than 12 (–5) percent of the maximum stored within the dambo and potentially available to flow. Thus, it seems depletion of water stored within the dambo is dominated by evaporation (estimated to be 838 mm y⁻¹ during 1995/96) rather than by contribution to stream flow.
- ❖ Preliminary water balance modelling (Bullock and McCartney, 1996) indicates that vegetation is a key factor in determining whether or not evaporation from the dambo exceeds that from the interfluvium. In the Grasslands catchment, evaporation from the dambo was found to be greater than from that part of the interfluvium covered by indigenous trees (miombo) and grass; during 1995/96, as a proportion of potential evaporation it was estimated to be 8 percent greater. This was attributed to the fact that the water table remained closer to the ground surface in the dambo, thus providing more water for evaporation from the dambo than from the interfluvium.

These findings contradict much that has been postulated about the hydrological functioning of dambos in the past and have important implications for the use of dambos for cultivation. The results indicate that large volumes of water may be stored within the dambo during the wet season. However, only a very small proportion of this water supports downstream recession flows and depletion is dominated by evaporation rather than by contribution to stream flow. Loss of water to evaporation rather than to

downstream flow indicates that water within some dambos can be put to productive use in growing crops (particularly shallow rooted crops) with little impact on dry season river flows. However, as new technologies become available, care is still necessary to ensure that water reserves are not over-exploited.

13.4. Estimating "safe" treadle pump withdrawals from dambos

Treadle pumps are manual pumps (operated by ones legs) to lift water from rivers and shallow wells. Developed in Bangladesh, they are increasingly available in southern Africa. For example, in Zambia alone it is estimated that there are now more than 2,500 treadle pumps being used by farmers to irrigate vegetables in dambo gardens. The pumps typically produce an average discharge in the range 1 to 2 ls-1, based on sustainable pumping over the day for one operator (Kay and Brabben, 2000). They are more efficient than irrigating by hand and enable farmers to increase productivity and the area cultivated.

Water may be the limiting factor in the extent to which dambos can be utilised. A few farmers pumping from a small stream or shallow groundwater may not cause much of a problem, but large numbers of farmers operating in the same area can result in over-exploitation of the resource to the detriment of all, including people living downstream. It is, therefore, necessary to estimate the maximum number of treadle pumps that can be safely used on a dambo. This requires the water budget of a dambo to be estimated.

The hydrological fluxes comprising the water budget of a dambo are rainfall, evaporation, outflow and inflow or seepage from the interfluvium (Figure 3). Results from the Dambo Processes Integration Experiment enabled these hydrological fluxes to be quantified. These data, combined with data from three other catchment studies (two in Zambia and one in Zimbabwe), made possible the development of an empirical relationship to estimate the annual flow from the interfluvium into the dambo (McCartney *et al.* 2001):

$$Q_I = \frac{I_F \cdot P \cdot A \cdot 1000}{(1 - I_F)}$$

where:

Q_I is the annual inflow to the dambo that originates on the interfluvium (m^3)

P is the annual rainfall onto the dambo (mm)

A is the area of the dambo (km^2)

I_F is the proportion of the total annual input into the dambo that originates on the interfluvium

I_F can be estimated using the equation:

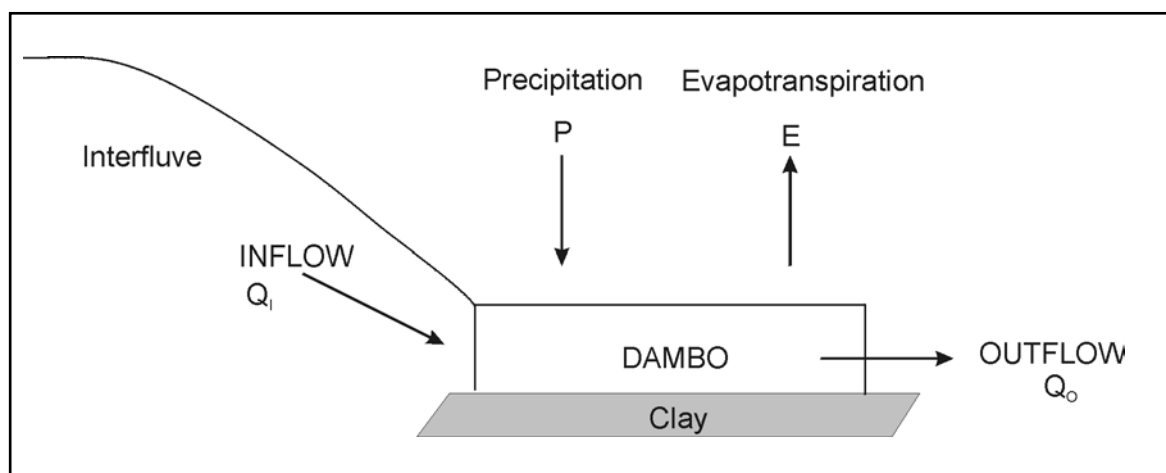
$$I_F = 0.08 \text{ DAMBO}^{-0.68} \quad R^2 = 0.91 \quad N = 4$$

where:

DAMBO is the proportion of the catchment area that is dambo.

Data from the Dambo Processes Integration Experiment indicated that only 20 percent of the total annual flow from the interfluvium into the dambo occurred in the dry season.

Assuming an average abstraction rate of 1.5 ls-1 and an irrigation time of 20 hours per week, then average water abstraction for a treadle pump is 108 m^3 per week. For a crop water requirement of 25 mm a week, typical of the dry season in southern Africa, this equates to an irrigation area of 0.43 ha.

Figure 3**Conceptualization of the hydrological fluxes that comprise a dambo water budget**

In many countries in southern Africa dambo gardens are typically 0.25 ha to 0.4 ha. Assuming 20 weeks of irrigation in the dry season (April to September) the average total abstraction for a pump is 2 160 m³, to provide 500 mm of evapotranspiration over 0.4 ha.

If it is stipulated that the amount of water abstracted for dry season irrigation should not exceed the average annual dry season inflow to the dambo, then it is possible, using the equations above, to estimate the maximum number of treadle pumps that can be safely used on a particular dambo. The results obtained for the research catchments (Table 27) indicate, not unreasonably, that the smaller the proportion of a catchment that comprises dambo and/or the higher the average annual rainfall, the greater the fraction of the dambo that can be safely irrigated with treadle pumps. The proposed upper limit on abstraction (i.e. no more than the average dry season inflow) is rather arbitrary, but is cautious, since it makes no allowance for water stored within the dambo at the end of the wet season. Of course, if the maximum numbers of pumps suggested were installed, in years with below-average rainfall, abstractions would exceed the dry season inflow and "wet season water" would effectively be removed from the dambo.

Table 26**Estimate of the maximum number of treadle pumps that can be used on a dambo**

	Catchment			
	Luano A, Zambia	Luano J, Zambia	Chizengeni, Zimbabwe	Grasslands, Zimbabwe
Catchment area (km ²)	1.43	1.28	2.74	3.33
Dambo area (km ²)	0.15	0.06	0.86	1.21
DAMBO	0.104	0.047	0.313	0.363
Average annual rainfall (mm)	1270	1270	900	860
I _F	0.367	0.629	0.174	0.157
QI (annual) (m ³)	110,448	129,191	163,046	193,801
QI (dry season) (m ³)*	22,090	25,838	32,609	38,760
Maximum number of treadle pumps+	10	12	15	18
Maximum area irrigated (ha)^	4 (27)	4.8 (80)	6 (7)	7.2 (6)

* Assuming that 20% of the inflow occurs in the dry season, as was observed at Grasslands

+ Limiting the maximum number to that which would extract the average dry season inflow

^ Nos. in brackets is the percentage area of the dambo that can be irrigated safely

13.5. Conclusion

Dambos provide substantial opportunities for irrigated agriculture for smallholder farmers in southern Africa. Increased utilization of dambos for agriculture could improve food security, reduce poverty and benefit peoples' livelihoods. However, care must be taken to ensure that human utilization is sustainable, and that valuable natural resources (including water) are not over-exploited. As this paper has demonstrated, quantitative understanding of system functioning, derived from scientific research, is essential for the implementation of successful wetland development and management strategies.

13.6. Acknowledgements

The Dambo Processes Integration Experiment was funded by the UK Natural Environment Research Council. The study was conducted in collaboration with the University of Zimbabwe and the Zimbabwean Department of Research and Specialist Services.

13.7. References

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Presentations by IWMI

14.1. Background information

IWMI's mission is to improve water and land resources management for food, livelihoods, and nature. This mission is operationalized under five research themes:

1. Integrated water resource management for agriculture
2. Sustainable smallholder land and water management systems
3. Water resources institutions and policies
4. Sustainable groundwater management
5. Water, health, and environment

IWMI is involved in a comprehensive assessment (CA) of water management in agriculture. The objectives of the CA include assessing the costs and benefits of agricultural water use in rain fed and irrigated areas, as well as wetlands. The outputs of the CA will inform the Global Dialogue Water for Food and Environmental Security, an initiative by UNEP, WWF, IUCN, IWMI, WHO, FAO, ICID, the Global Water Partnership, and the World Water Council. The proposed research will contribute directly to the CA.

In Southern Africa, IWMI has begun working on a "conceptual framework for classification of inland wetlands for sustainable development". The objectives for such a sustainable development-oriented classification are to provide a nationally, and subsequently regionally, consistent basis for delineating dambos that can be developed for crop production and those that cannot, and to provide guideline and consistent decisions about dambo resource management. This framework will form the basis of a decision support tool for planners when dealing with wetland uses and development, both proposed and new. It will provide guidance as to which wetlands have potential for further use such that more benefits can be derived. A workshop was held with some SADC regional partners in April 2000. The purpose of this workshop was to highlight some of the critical issues and challenges relating to inland wetland development that could benefit from further research. In South Africa, IWMI is currently involved in a public participation process for Catchment Management Agency formation. Some research on indigenous wetland tenure systems in the Olifants Basin has also commenced.

In southern Sri Lanka, IWMI has studied the impact of upstream irrigation on the Bundala coastal lagoon system (a RAMSAR wetland). The study shows that irrigation water inflows have significantly affected water quality (reduced salinity particularly), resulting in changed flora and fauna in the affected lagoons. Traditional shrimp and finfish fisheries have been adversely affected, and stakeholders now resort to harmful practices such as shell mining and hunting to eke out a living. The wetlands are important feeding/resting sites for local and migratory water birds.

The activities of IWMI in Southern Africa are coordinated from the Regional Office for Africa in Pretoria. The strategy for Africa is to contribute to increased productivity, food security, and poverty eradication.

14.2. A framework for use-based classification of wetlands for sustainable management

*Presentations given by Barbara van Koppen and Mutsa Masiyandima,
International Water Management Institute (IWMI), Africa Office, Pretoria, South Africa*

The presentation gave the participants an alternative potential way of looking at classification of wetlands in the region. This is a field that forms a critical component of the studies on wetlands for sustainable development in the region, and yet it has been barely attended to. Part of the reason for the poor attendance to this issue is its complexity, given the variability in wetland ecologies and the number of uses they are put to. A bold challenge was made to unravel the tangle by suggesting a potential system to which she was inviting comments. In the proceedings, only the abstract has been included as the concept continues to be developed.

Abstract

Small inland wetlands, sometimes referred to as dambos, mbugas or vleis, are strategic ecosystems for small-scale agricultural production and livelihoods support in general. Despite positive attributes of the livelihoods support function of wetlands, utilization of wetlands for agricultural purposes has often attracted criticism. It is said to be destructive to the environment and leads to biodiversity losses. The dialogue between diverging groups concerned with wetlands has been troubled with either group arguing for extremes. It is believed that if wetlands are realistically classified according to their potential to support human interventions, more informed decision-making will follow, resulting in optimization of benefits for both livelihoods support and the environment. While there are several classification systems that are used in different countries in southern Africa, they do not address this particular need. To fill this gap, this paper proposes a use-based classification system for wetlands in southern Africa, which will serve to guide further development of some inland wetlands for crop production. Moreover, for policy relevance, the wetland classification system will address the valid concerns for sustainability of current and future use, while continuously increasing benefits for various user groups. The classification system will highlight where demands of various user groups on the resource base are simply conflicting and a political choice between trade-offs needs to be made. The demands by society's members, who derive benefits from wetland cropping and other wetland uses, need explicit attention in the analysis and political choice. It will categorize wetlands into classes that reflect the potential for further use of wetlands. Examples of wetland classes from this system include those over-utilized, where interventions are irreversibly affecting land and water resources; the optimally-utilized, where there is a sustainable balance between available resources and their exploitation; and the under-utilized ecosystems, where there is room for more intensive use.

ANNEXES

Workshop agenda

FAO Regional Workshop

“Wetland Development and Management in SADC Countries”

Holiday Inn, Harare, Zimbabwe, 19 - 23 November 2001

Agenda

Date & Time	Subject	Presenter
Monday 19-11-2001		
Morning	Arrival of the participants	
13.30 - 15.00	<i>Lunch</i>	
15.00 - 15.30	Registration	
15.30 - 16.00	<i>Refreshments</i>	
16.00 - 16.30	General Introduction to the Workshop FAO Wetland Programme Discussion and adoption of the agenda Housekeeping	Nico van Leeuwen (FAO-HQ) & Karen Frenken (FAO-SAFR)
16.30 - 18.15	Presentations followed by discussions: <ul style="list-style-type: none"> Wetland development & management in Zimbabwe: Seke research programme SADC and wetlands IWMI and wetlands Understanding dambo hydrology: implications for development and management 	<ul style="list-style-type: none"> Isiah Mharapara (ARC) Toshi Serizawa (SADC) Barbara van Koppen (IWMI) Matthew McCartney (CEH)
18.30 - 20.00	<i>Cocktails</i>	
Tuesday 20-11-2001		
Session 1: Wetland Policies and Strategies		
08:30 - 09:00	• Presentation of Key Document	Isiah Mharapara
09:00 - 10:30	• Discussions in groups	
10:30 - 11:00	<i>Refreshments</i>	
11:00 - 12:00	• General discussion - conclusions	
12:00 - 13:30	<i>Lunch</i>	

Date & Time	Subject	Presenter
Session 2: Wetland Inventories and Characterization		
13.30 - 14.00	• Presentation of Key Document	Isiah Mharapara
14.00 - 14.15	• Classification of wetlands	Mutsa Masiyandima (IWMI)
14.15 - 15.30	• Discussions in groups	
15:30 - 16:00	<i>Refreshments</i>	
16:00 - 17:00	• General discussions - conclusions	
17.00 - 17.15	• Evaluation of the day and housekeeping	
Wednesday 21-11-2001		
Session 3: Projects and activities, exchange and dissemination of information		
08:30 - 09:00	• Presentation of Key Document	Isiah Mharapara
09:00 - 10:30	• Discussions in groups	
10.30 - 11.00	<i>Refreshments</i>	
11:00 - 12:00	• General discussions - conclusions	
12:00 - 13:30	<i>Lunch</i>	
Session 4: Training and Education		
13.30 - 14.00	• Presentation of Key Document	Isiah Mharapara
14:00 - 15:30	• Discussions in groups	
15:30 - 16:00	<i>Refreshments</i>	
16:00 - 17:00	• General Discussions - conclusions	
17.00 - 17.15	• Evaluation of the day and housekeeping	
Thursday 22-11-2001		
7:30 - 14:30	Field visit: • Seke Dambo Research Programme • Domboshawa: FAO SPFS Treadle Pump Programme	
13:30 - 14:30	<i>Lunch</i> (on the road) and return to Harare	
14:30 - 15:30	SADC Wetland Action Programme and Technical Assistance Projects	
15:30 - 16:00	<i>Refreshments</i>	
16.00 - 17.00	Preparation of conclusions and recommendations of the workshop (by small task group)	
17:00 - 18.00	Presentation and adoption of conclusions and recommendations of the workshop by all participants	
18.00	Closure of the workshop	
Friday 23-11-2001		
Departure of participants		

Opening address

By:

Nico van Leeuwen

Senior Officer Irrigation Development, FAO – Headquarters

Dear colleagues, ladies and gentlemen,

It is a pleasure for me to wish you, on behalf of FAO, welcome to this workshop on ‘Wetland Development and Management in SADC countries’.

When one compares the title of this workshop to those of some other workshops, one can notice that the issue is a very broad one. Development and management of wetlands includes many different technical and non-technical disciplines. The title is not even restricting our coming discussions to ‘agricultural’ development and management. This implicitly means that there can be other uses of wetlands than agriculture, and that also these other uses need management.

Wetlands have always been subject of special attraction. It is the presence of water that is at the same time a problem and a blessing. Too much water can be a problem because land that is heavily flooded cannot be cultivated during the main cropping season. In some countries like Bangladesh, floods can be so violent that human life is put in danger. But water is generally also a blessing because without water no plant can grow. In fact, thanks to the irregular availability of water in wetlands such as flood plains, swamps, dambos, and whatever names they have been given, Mother Nature has created in these areas an enormous biological richness that scientists only started to recognize a few decennies ago. It is not without reason that for many centuries, centres of civilization have prospered in wetlands or close to them. One can just mention the deltas and floodplains of the Nile, the Rhine, Ganges, Mekong, Euphrates and Tigris. But there are many more examples of smaller communities who lived, or are still living, in prosperity thanks to the nearby presence of wetlands.

Wetlands produce fish and wild animals, all kinds of fruits, comestible plants and roots, medicinal plants, building materials such as grass and reed, and they are good grazing land for cattle in the dry season. Until recently, the actual values of all these “productions” of wetlands were not taken seriously. The distress of many rural communities, following hydrological changes of wetland, in particular of flood plains, as a consequence of the building of storage dams and other water regulating structures, has lead to more detailed investigations into the actual functioning of wetlands. Several studies have demonstrated that the economic value per cubic metre of water so-called “lost” during floods exceeds, by far, the value of this water when used for irrigation of cereal crops. And we are talking here simply about actual production and not even mentioning the value of the maintenance of the biodiversity of plants, animals, fish, insects, birds, etc. in wetlands that are to be protected and conserved for future generations.

If wetlands are so rich, why is there a need to develop and manage? Why can’t these lands be left in peace, to function as they have been doing for so many centuries? Suddenly wetlands seem to have

become important. Is this a fashion that suddenly started and may also suddenly stop? We in FAO, we do not think so. The reason for the accrued attention for wetlands is that the world around us has changed. There are more and more people and, in particular, more and more large cities that need food, and the full potential for food production should be used. This means that, in addition to the increase of food production from rain-fed agriculture and irrigation of dry land, more food should be produced in wetlands. Also, with regard to biodiversity, the world around the wetlands has changed. Wetlands do not exist in isolation and it is now understood that if nothing special is done to protect RAMSAR wetlands against intrusion of excess fertilizers and pesticides from upstream, the capital of biodiversity will slowly disappear from even these protected wetlands. There is a need for protection and there is a need for production.

It is generally accepted that many wetlands do not present such biological capital that they should be protected from agricultural use, and let's now look at the agricultural production of those wetlands.

In view of the complexity of the soil and water relationship in wetlands, the increase of agricultural production of these lands is not such an easy undertaking. It is not a matter of just drain, or just irrigate or just protect against flooding. It is a matter of a bit of everything. It is also not a matter of one dambo, but a whole series of dambos or flood plains downstream and, even to some extent, upstream. There is no standard methodology or recipe for wetland development. Somebody has said that the common feature of wetlands is that they are all different. This means that maybe we should talk about a methodology for wetland development, but maybe even better about a philosophy.

Such a philosophy for wetland development could consist of trying to remain as close as possible to the natural situation: protect a bit against flooding but do not exclude it, drain as little as possible and select crop varieties adapted to the ecological conditions of a particular wetland, and do not try to change the conditions of wetlands to grow a particular crop, etc. In short, try to get the maximum out of this peculiar ecosystem. Maybe this is what RAMSAR called "wise use of wetlands". However, there is the ecosystem and the people. Not all people are naturally wise, they have to be educated and learn that particular wisdom.

Wetlands cover an important part of the land area in Southern Africa. In order to assure the wise use of these wetlands for agricultural production there are a number of conditions. There is a need for better knowledge of the ecological conditions in wetlands, which means characterization and inventories. There is also a need to know present agricultural practices and their influence on the natural conditions of the wetlands. Information needs to be made available and exchanged between all partners. Government policies and strategies can either support or harm the wise use of wetlands, and they should be harmonized between countries in order to avoid cross-border problems. And probably the most important issue is that people at all levels should be trained how to go about working with wetlands. These are, globally, the aims of the Wetland Development and Management Programme (WEDEM) that FAO put into place some years ago and that we are trying to make more active. FAO has been active on the ground for many years: a number of technical assistance projects were undertaken in specific countries and have produced good results. What we are now aiming at is a more systematic approach, and the use of regional synergies.

The SADC region has been selected for the importance of the wetlands in this part of Africa. We can congratulate ourselves that the region has a number of experts that know the problematics of wetlands. FAO found and asked them to collect information about certain aspects of wetland development in their respective countries. Most of them are present today and I would like to thank them for their contributions. They did a very good job and we have not yet finished exploiting fully the content of their interesting reports.

We in FAO are also very happy that, through a crossing of interests, contacts have been established between international organizations looking at wetlands from different points of view. The International Water Management Institution and the International Conservation Union are among us in this workshop. UNEP is also interested in the subject and has promised collaboration with the submission of a project request to the Global Environment Facility. Collaboration with other organizations may be established in the future. What is in fact happening in the SADC region is that a Dialogue is being established on Water, Food and Environment. Some of you may know that ten world organizations, that are dealing with water and environment, decided to establish such a Dialogue on Water, Food and Environment during the Water Summit in the Hague one and a half years ago. Since then, there have been several high-level meetings about this Dialogue and how to establish national and regional platform for such a Dialogue. In the SADC region good progress with the Dialogue process can already be reported.

This workshop is going to practice this dialogue on water for food and/or for the environment during the coming days. We hope that you, participants in this workshop, will be able to define the main line regional and national action programme on wetland development and management for SADC countries. This workshop will not halt with the publishing of its proceedings sometime early next year but is the beginning of a number of activities that will ultimately result in higher agricultural production from the wetlands, in a sustainable way, to provide the necessary food to the increasing population, in particular in urban areas, and reduce the poverty of the rural population.

To finish, I would like to thank all of you for coming to this workshop. I wish you all fruitful discussions and a pleasant stay in Zimbabwe.

Thank you for your attention.

Harare, Monday 19 November 2001

Closing address

By:

Nico van Leeuwen

Senior Officer Irrigation Development, FAO – Headquarters

Dear colleagues, ladies and gentlemen,

Only three days ago, yes, it was on Monday evening and now it is Thursday evening, we started this workshop with the warning that the subject we were going to handle: “Development and management of wetlands”, was a very broad one. We discovered indeed that the subject was very broad when, during the past few days, we were briefed on, and discussed:

- ❖ A comparative analysis of policies and strategies for sustainable development and management of wetlands for agricultural purposes in SADC countries
- ❖ Inventories and characterization of wetlands in SADC countries
- ❖ Information on past and ongoing national and regional projects and activities on wetland development and management for agricultural purposes
- ❖ Training on participatory approach, technical in-service and formal training on wetland development and management for agricultural purposes

Thanks to the intelligent selection by Karen Frenken, the working groups were composed of colleagues from different countries and with different backgrounds, which contributed towards making our discussions very rich and complete. Yes, the Dialogue on Water, Food and Environment was there all the time. And yes, the broad subject was covered with, at the same time, the desire to continue the discussions in more depth. The discussions showed how important the wetlands are for the agriculture in SADC countries, and the presentation this afternoon by our knowledgeable chairman was there to remind us of some facts and figures.

The excellent technical presentations, on the first afternoon should not be forgotten as they showed us the complexity of wetland systems, and also the important results that can be obtained if these wetlands are handled in the right way. The visits of this morning showed us what can be achieved in the field, and how improved wetland management increases the income of farmers, in particular women farmers.

At the end of this workshop, we are all looking forward to the proceedings that will present in print the results of our work of the last few days. But I have the very strong feeling that we are all going back to our countries, or our organizations, with plans to start working on some of the issues we have talked about. The representatives of the international organizations and from SADC will do their best to obtain the necessary funding that will allow large-scale activities that cannot be supported from national resources.

Before returning to our countries, I would like to express, on behalf of us all, our thanks to Karen, who has been the key person in the preparations of this workshop over the last 12 months. Thanks to her intensive work with the national consultants and the many administrative tasks that have occupied her evenings and weekends, the preparation of this workshop was perfect. Thank you, Karen.

Another important person who has contributed enormously to the success of this workshop is our chairman. Isiah has succeeded in the huge task of analyzing and digesting the hundreds of pages written by the national consultants, and in summarizing these reports in well-prepared summaries. In addition, he has presented these key documents to us in such a way that even those who did not have time to read them were fully informed on the subject, and could participate in the discussions. And we must not forget the triple performance of being the organizer, the presenter and, at the same time, also a charming chairman. Thanks Isiah.

Then, of course, our thanks to the people that have taken care of all practical arrangements: the team of the Agricultural Research Council, Florence, our secretary, the administrative staff of the FAO Sub-Regional Office, and the personnel of the hotel, who took care of the meeting room and the refreshments.

But the most important words of thanks are to all of you, the participants in this workshop. It is your active participation that has contributed most to the success of this workshop. I sincerely hope that this workshop is going to be the start of a continuing and fruitful collaboration between all of you, one that will finally result in a better and sustainable development and management of wetlands in SADC countries, and will contribute to increased food security and a better living for all the small farmers that depend on these fragile, but also very rich, wetlands.

Wishing you a safe journey home, I would like to finish with the wish to see all of you again very soon for a follow-up wetland meeting.

Harare, Thursday 22 November 2001

Annex 4

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