SMALL SCALE FARMING ON WETLAND RESOURCE UTILISATION: A CASE STUDY OF MANDLANZINI, RICHARDS BAY.

BY

THOKOZANI SIVIKELE MTHIYANE

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KwaDlangezwa

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DECLARATION

I, Thokozani Sivikele Mthiyane, hereby declare that this dissertation: ***Small Scale Farming on Wetland Resource Utilisation: A Case Study of Mandlanzini, Richards Bay,*** is my own original work. All the sources that I have used or quoted have been indicated and acknowledged by means of complete references. It is further declared that this dissertation has not previously been submitted to any institution for degree purposes.

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T. S. MTHIYANE DATE

We hereby declare that this dissertation has been submitted for examination with our approval.

_____ _____

DR. E.T. DLAMINI DATE
(Supervisor)

_____ _____

MR D.W. MNCUBE
(Co supervisor)

DEDICATION

I would like to dedicate this work to my grandfather, the late Inkosi uKasazi ‘Sogwemase’ Mthiyane for his contribution in uniting the Mqedi tribe as well as his superb leadership.

ACKNOWLEDGEMENTS

I thank GOD, Umvelinqangi for giving me the courage and strength to withstand the pressure and obstacles, I have faced in the completion of this programme. There were many fought challenges but determination and courage were the source of inspiration in this achievement.

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I would also like to thank my co-supervisor Mr D.W. Mncube (known as Madumi) for his role and intellectual guidance through the entire course of this research study.

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ABSTRACT

Wetland utilisation by rural communities in South Africa poses a serious challenge for natural resource conservation. The growing rate of rural poverty, poor education and socio-cultural beliefs contribute towards the current plight of many wetlands. The challenge that faces wetland sustainability stems from the over utilisation of wetland resources for survival as well as cultural activities that are practiced. This study aimed at investigating the impact of various wetland activities performed on a daily basis by local communities of Mandlanzini in the quest for survival.

The community groups were selected to study their way of life and their relation to their local environment in order to deepen the understanding of their activities and impact on the wetland. Household data collected, gave a clear picture of socio-economic status of the community. The results of the study showed that community members, on the lower end of salary scales, were the ones who relied heavily on raising income by using resources available from the wetland. Research data showed that, there is a high demand for staple food such as '*amandumbe*', banana, and sweet potatoes by the community under study. The study also showed that indigenous knowledge can play an important role towards the restoration of wetlands. Furthermore, as many community members practiced subsistence agriculture, most of their livestock depend on wetland resources. All these constituted good reasons why communities should be involved in wetland management and conservation

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ACRONMYS AND BBREVIATIONS

CAR	Conservation of Agricultural Resources Act
CARA	Conservation of Agricultural Resources Act
CBA	Cost-Benefit Analysis
CBO	Community-Based Organisation
DEAT	Department of Environmental Affairs and Tourism
ECA	Environmental Conservation Act
EIA	Environmental Impact Assessment
EMA	Environmental Management Act
EMF	Environmental Management Framework
EMP	Environmental Management Programme
IK	Indigenous Knowledge
IKS	Indigenous Knowledge Systems
IUCN	International Union for the Conservation of Nature
KZN	KwaZulu-Natal
LED	Local Economic Development
MWP	Mondi Wetland Project
NEMA	National Environmental Management Act
NGO	Non – Government Organisation
NWRP	National Wetland Rehabilitation Programme
TEV	Total Economic Value
WESS	Wildlife and Environmental Society of South Africa
WSSD	World Summit on Sustainable Development

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CHAPTER ONE

ORIENTATION TO THE STUDY

1.1 INTRODUCTION

The utilisation of wetlands for various activities in South Africa seems to be under threat from different practices employed by the local community. Davies and Day (1998) have argued that the extensive utilisation of wetlands stems from the series of demands arising from growing rural poverty and cultural beliefs. In addition, Barbier, Acremanm and Knowler (1997) state that such practices impact negatively on the management of wetlands as many indigenous people lack knowledge about the proper restoration of wetlands. Several campaigns initiated by government and non-governmental organisations in pursuit of efficient utilisation of wetlands resources seem to be futile.

Wetlands resources restoration involves a complex web of a myriad of interactions that take into account local knowledge acquisition from both non-formal and formal education. In the process, these forms of knowledge construction seem to be missing analysis from a socio-cultural viewpoint, which may strengthen understanding of impacts of activities arising from the local communities' general dependence on wetland resources. The complexity surrounding the assumption that rural communities tend to intensify their activities in order to satisfy their basic needs can be interpreted in many different ways. Of course, new ideas with regard to the utilisation of wetlands require data pertaining to socio-economic analysis, livelihood strategies, wetland resources and knowledge construction. The objective therefore, is to provide insight into these perspectives while generating a

wetlands ecosystem information database based on the poor communities of Emandlanzini, North of Richards Bay.

1.2 BACKGROUND OF THE STUDY

Mandlanzini is located in a semi-rural area that operates under the City of uMhlathuze, which is a local municipality situated within the uThungulu District Council area in KwaZulu-Natal (www.richemp.org, 2008). The area comprises rural settlements known as phases, wetlands, pastoral areas and nature reserves. The majority of rural settlements are located within the Tribal Authority areas. The area has shallow wetlands, which act as the local economic heartland of the people. Sugarcane fields, timber plantations, wetlands and fresh water lakes surround the study area. These elements contribute to the scenic environment and tranquil atmosphere that contributes to the popularity of the towns as tourist attractions (www.richemp.org. 2008).

It is clear that from the tourism perspective, gaming and the environment have the ability to attract visitors who will not only enjoy the urban environment, but who will also engage in various recreational activities. On the other hand, travel leads to the development of various modes of transportation, by roads, rail, air and sea within the area. The proposed establishment of wetlands ecosystem information database based on the poor communities in the study area, would contribute significantly to the improvement of living standards. It is further anticipated that Richards Bay and Emandlanzini, located in the North of Richards Bay, would as a result develop economically and would provide far more employment than it may be anticipated. Job opportunities for many local residents could be created, particularly when the small scale farming activities take place on the wetland environment as well as resource utilisation.

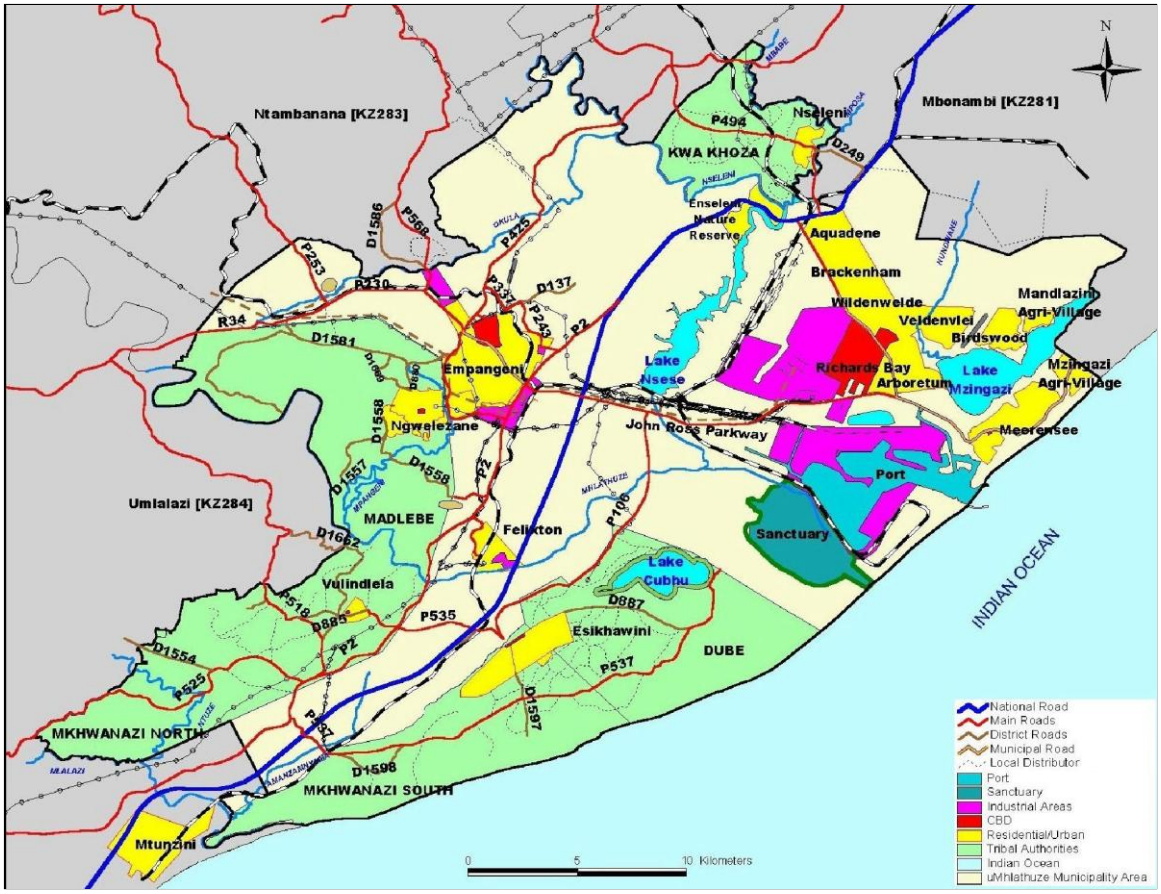

Figure 1.1: Map of Richards Bay and Mandlazini Area

[Source: www.richemp.org, (2008)].

The strategic location of Richards Bay [Refer to Figure 1.1] promises an improved industrial and manufacturing centre as well as the increased influx of international tourists which would bring in foreign income. Therefore, a well-developed agricultural and farming activities located on the wetland of Richards Bay and Emandlanzini, would be beneficial to the local communities. The latter is one of the main objectives of this research investigation. Considering the current growth in industrial activities, it can be predict that there will be an increased consumption of food resources in the study area. These development would directly and indirectly improve the employment situation in the study area.

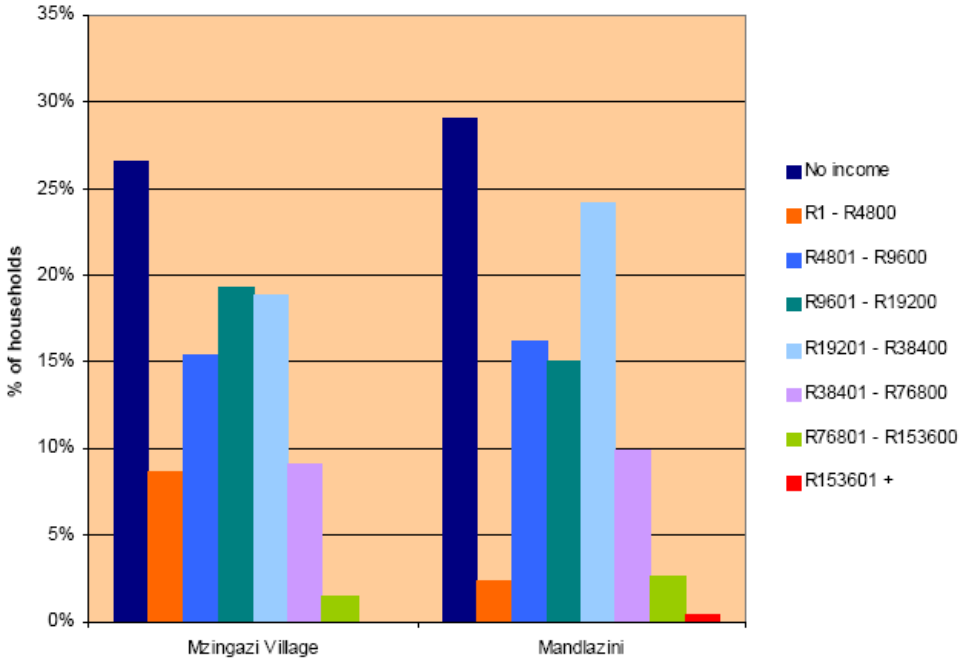

Figure 1.2: Annual household income at Mandlanzini and surrounding areas

As shown in Figure 1.2, unemployment levels at Mandlanzini and the surrounding areas are high in comparison to world standards. However, the unemployment levels depicted mainly relate to employment in the formal sector and do not reflect the true situation. For instance, economic activity in tribal areas, such as production for own use, arts and crafts, and informal sales are generally disregarded and this creates the impression that tribal folk are without sources of income and the means to survive from day to day.

Many people prefer the quality of life experienced in the Mandlanzini tribal area – provided that amenities normally associated with urban areas, such as water, electricity, schools and clinics, are available. There are still very few economic and formal employment opportunities in the area and this leaves the majority of the residents despondent. About 29% of the households in Mandlazini earn no income at all.

1.3 PROBLEM STATEMENT

Studies in several major catchments reveal that between 35% and 60% of the wetlands and the benefits they provide, have already been lost (Lande, 2008). Most wetlands face extinction or severe loss, mainly due to the inactivity of the people, but also because of the various animals found in the wetlands. Destabilisation of both flora and fauna in the wetlands that result from the trampling hooves of sheep and goats has resulted in soil erosion (Davies and Day, 1998). In Richards Bay, for instance, several wetlands are used for growing bananas, but also *amadumbe* and other vegetable crops. These activities usually call for the creation of furrows to drain the wetlands so that people can grow their crops. This of course poses a threat to wetland sustainability and, in turn, to the animals that live in the wetlands.

People tend to build their homes on wetland sites for easy access and control of their farming activities and their incorrect utilisation of the areas leads to rapid depletion of resources and eventual deterioration. Some studies have attempted research aimed at the development of a national policy and strategy for wetlands conservation, but people seem to be unaware of these efforts and policies that may have emanated from them [http://www.iwmi.cgiar.org/Research-Impacts/Research-Themes/SMW. (2008); http://www.eoearth.org/article/GreaterStLuciaWetlandPark.SouthAfrica. (2008)]. Despite the existence of policies and strategies, it seems that wetlands continue to be under threat from developers and communities. In this regard, this study seeks to examine the impact of communities on the wetlands of Mandlazini.

1.4 MOTIVATION OF THE STUDY

The motivation for this study arose from the theme of the World Wetlands Day 2006, which was "Wetlands and Water-supporting Life, Sustaining Livelihood". This study is therefore a response to the challenges that arise

from the reported loss of wetlands. There is a need to maintain and enhance the benefits that wetlands provide. The study is also motivated by the fact that the wetlands of the Umhlathuze area are of international importance as they are the southern destination of many migratory wading birds (Lande, 2008). It therefore becomes imperative to conduct a study on wetlands utilisation and restoration by indigenous communities since the majority of rural communities depend on them to eradicate poverty.

Some local community members plant crops in the wetlands and depend on the sale of these crops to earn money for living purposes. Since the creation of "Working for Wetlands," the programme invested in the rehabilitation of 175 wetlands nationwide, approximately 1 100 job opportunities and over 70 000 training days had been provided. The teams working on rehabilitation of wetlands constitute a minimum of 60% women, 20% youth and 1% of people with disabilities (Lande, 2008). It is hoped that these wetland activities will make people aware of the importance of wetlands, while others will learn to appreciate the wetlands restoration programme. Certainly, the combined efforts would help to reinforce the link between the communities and their environment, which is essential if sustainable utilisation is to be realized.

1.5 THE PURPOSE OF THE STUDY

The purpose of this study is to investigate the impact of socio-economic factors and indigenous knowledge on wetlands utilisation in Mandlanzini. In addition to this, the study examines the effect of non-formal education on wetlands restoration, since everyone depends directly or indirectly on the wetlands. Several methods of planting wetlands crops were examined with the view to assess the sustainability of wetlands. Indigenous methods of planting are important in the interest of the conservation of plants and animal

species that depend on wetlands. The study also takes other human activities that have an impact on the wetlands into consideration. Lande, (2008) states that there is more life, hectare for hectare, in the wetlands than in almost any other habitat, among them huge numbers of insects, birds, fish and other animals. The study also shows that it is important for community leaders (izinduna) and councillors to be environmentally literate, especially to prevent the allocation of housing near or within the wetlands. According to Roth (1992), environmental literacy is based on six major areas, namely environmental sensitivity, knowledge, skills, attitudes and values, personal investment and responsibility and active involvement.

This study is also aimed at raising awareness about the dangers of alien plants commonly found within the wetlands and to raise awareness about the importance of wetlands among the local youth. Agenda 21, which outlines the sustainable development blueprint for the 21st century, recognises in Chapter 36 that education, public awareness and training are crucial for sustainable development, and that participation and involvement of young people are essential in its implementation (Lande, 2008).

1.6 SIGNIFICANCE OF THE STUDY

The study is mainly intended to raise awareness about the importance of biodiversity management in our environment. As the wetlands exhibit an immense biodiversity of plants and animals, the interdependence between human beings and the environment needs to be appreciated, also in terms of conservation for future generations. The study explores the correct usage of wetlands in order to promote environmental sustainability. It assesses the effectiveness of indigenous knowledge and non-formal education as engines for wetlands restoration.

Recommendations are also made with regard to how indigenous knowledge should be used in order to advance education for sustainability. The study concentrates on advancing the role of environmental education so that all forms of education play a vital role in enhancing the environmental literacy of citizens with regard to the value of wetlands. In doing so, the study hopes to challenge environmental educators to become more aware about the urgent need to restore wetlands. The study also hopes to bring to the attention of policy-makers and curriculum designers the importance of involvement in education towards the wise usage and protection of the wetlands of this country. The aim is to maintain a high standard of relationship between society, environment and education.

Finally, the significance of this study revolves around that fact that it would make a contribution to the field of wetlands research, as well as to the body of literature in biodiversity conservation and wetlands. Consequently, some studies (Hendee *et al.* 1990; Goodman, 2003; Lubbe, 2003) have shown that resource managers, recreators and community members do not perceive participation and experience in the same way. The managers may seriously misjudge what communities are seeking from their interaction with the wetland, as well as how they are likely to respond to what appear to be impacts.

1.7 AIMS AND OBJECTIVES OF THE STUDY

The overall aim of the study is to examine the impact of the activities of the local communities of Mandlanzini, situated to the North of Richards Bay, on the wetlands. The aim of the study is subdivided into several objectives listed below:

- To examine how the socio-economic situation in the rural area impacts on the wetlands.
- To identify various dominant wetland crops that local people use.
- To examine how people's attitudes have shaped the way they depend on wetlands.
- To investigate the forms of cultural traditions practised by local residents using wetland resources.
- To establish the role of indigenous local knowledge and its impact towards alleviating the degradation of the wetlands.
- To propose recommendations for future implementation strategies.

1.8 DEFINITION OF TERMS

In many instances researchers have found it necessary to emphasise the need to understand the terminology and usage of concepts in the research inquiry. For purposes of better and contextualised understanding of concepts, these have to be spelt out in a non-ambiguous manner, so as to offer the working meaning for the research document.

1.8.1 Wetlands

A wetland is land which is transitional between terrestrial and aquatic systems, where the water table is usually at or near the surface, or in which the land is periodically covered with shallow water and which land in normal circumstances, supports or would support vegetation typically adapted to life in saturated soil. Wetland is a name used to describe places that are frequently or permanently water logged and has specifically adapted plants and animals living and growing in them (Ramsar, 1997).

Wetlands are found where the land form (topography) or geology slows down or obstructs water flow through the catchments, causing the surface soil layers to be water logged. Wetlands can be permanently, seasonally or even temporarily, water logged. Wetlands are areas of marsh, ten, peat land or water static or flowing, fresh, brackish or salt including areas of marine water the depth of which at low tide does not exceed six meters (Ramsar, 1997; Rogger, 1995).

1.8.2 Wetlands' restoration

Wetlands restoration is the kind of restoration that requires hydrological and morphological rejuvenation so that the restored site mimics its original environment, which then mirrors the adaptive abilities of the target array of plants and animals. Wetlands restoration has come of age since 1970, when wetlands conservation became important around the world. Since then many wetlands have been created or restored, typically without attention to the importance of natural disturbance in a landscape setting (Dugan, 1990).

1.8.3 Restoration

Restoration is the turning of a site to a condition similar to the one that existed before it was altered, along with its pre-disturbance functions and related physical, chemical and biological characteristics. The goal of restoration is to establish a site that is self-regulating and integrated within its landscape, rather than re-establishment. The aforementioned original condition can be impossible to define and/or restore within the contexts of current land use amidst global climatic change. Sometimes restoration requires the chemical clean-up of toxic materials (Dugan, 1990).

1.8.4 Environmental education

Environmental education is a lifelong multi-disciplinary approach to learning that helps people to understand and appreciate the environment and their

connection to and impact on it. Environmental education is a process that develops awareness, knowledge and understanding of the environment as well as positive and balanced attitudes towards it, thereby also developing skills that will enable students to participate in assessing the state of the environment to enhance a possible community problem solving process. It prepares us for an ecologically sustainable future. It empowers individuals to maintain and restore the earth's natural systems and to foster support for the wellbeing of future generations by promoting sustainable lifestyles. This requires understanding of the need to achieve a balance between the environment and social and economic impacts for development. It involves respecting and valuing the achievements of the past and supporting the preservation of those aspects of the built environment which reminds us of those achievements. It also has a spiritual focus, inspiring an emotional and sensitized response from people, not only in their appreciation of the wonders of the natural world, but making them feel as one with the environment (Environmental Education Policy for Schools, 2001).

1.8.5 Education for sustainability

Education for sustainability is a process of educating people on how to use resources effectively such that they are available for future generations. It differs from education about the environment, where environmental issues are taken as falling naturally into the disciplinary areas of study as environmental facts or concepts. Education about the environment often neglects the integration of natural and social systems. Potentially, any subject is a resource that can be used to educate for sustainability.

Education for sustainability is the lifelong process that leads to an informed and involved citizenry that have developed the creative problem-solving skills, scientific and social literacy and commitment to engage in responsible

individual and co-operative actions. These actions will help ensure an environmentally sound and economically prosperous future. Education for sustainability has the potential to serve as a tool for building stronger bridges between the classroom and business, and between schools and communities [Environmental Education Impact Policy [EEIP], (1995)].

1.8.6 Environmental Education Policy

Environmental education policy is designed to guide schools in developing and enhancing environmental education programmes that equip students with the understanding and skills required for active and informed participation in managing the environment. Most importantly, such a policy aims to produce students who understand the importance of caring for the environment in order to secure a better quality of life for present and future generations. Environmental education policy describes the rationale for environmental education, the aims and objectives of environmental education, the three focus areas of environmental education, the development of a school management plan and a framework for evaluating and monitoring the implementation of environmental education in schools [Environmental Education Impact Policy [EEIP], (1995)].

1.8.7 Sustainability

It was the World Commission on Environment and Development (WCED, 1987:8), that initiated the definition of sustainable development, which refers to the improvement of human and physical environment with a view of meeting the needs of the present communities "without compromising the ability of future generations to meet their own needs". It embraces the ability of an ecosystem to maintain ecological processes and functions, biological diversity and productivity over time. This implies the use of ecosystems and their resources in a manner that satisfies current needs, while allowing them

to persist in the long term. This includes the ability to provide for the needs of the world's current population without negative environmental effects or incurring impossibly high costs to anyone involved. Sustainability is the approach that encourages the society to meet the needs of the current generation without sacrificing the ability to meet needs of future generations. Sustainability is an architectural property of a programme, which allows continued viability. A world accepted definition of sustainability is given by IUCN (1997); this definition states that sustainability is the meeting of the needs of the present generation without compromising future generations in meeting their own needs.

1.8.8 Non-formal education

Non-formal education is a very broad and varied field and it is difficult to make blanket recommendations that will be universally appropriate. It can ensure the availability of a range of specifically designed environmental education courses. It encourages the formation of partnerships between organizations involved in non-formal environmental education. It also encourages the inclusion of environmental components in all relevant training and extension programmes, including accredited vocational courses, on-the-job training, literacy and adult basic education, informal agricultural extension work, community development programmes etc. Non-formal education makes government and private funding routes and processes more accessible to community based agencies actively engaged in education for sustainability [Environmental Education Impact Policy [EEIP], (1995)].

1.9 ORGANISATION OF THE STUDY

Chapter One has set out the orientation of the study, including introduction, problem statement, motivation, purpose, objective, significance and

organisation of the study, concluding with definitions of terms. Chapter Two provides a review of the literature on wetlands management and restoration and outlines the importance of wetlands, their sustainable use, the rehabilitation of damaged wetlands, public participation and the part played by indigenous knowledge in securing wetlands management in terms of legal and policy implications. Chapter Three deals with research design, data collection, sampling procedures and ethics as applicable to the study area. Chapter Four provides a data analysis and an interpretation of the findings of the study, while. Chapter Five reviews the study, draws certain conclusions and provides recommendations. This final chapter also makes suggestions for future research.

1.10 CONCLUSION

In this chapter an attempt has been made to orientate the reader to the study as a whole. The background, problem statement, significance and the objectives of the study were carefully described. Furthermore, the study intimated the need for policy that would address the relationship between the local communities and the wetlands in their area. The latter was with a view of bringing about changes so as to achieve sustainable development of the environmentally sensitive resources in the study area. To achieve these aims this chapter has set out the orientation of the study, giving appropriate objectives, definition of terms and the structure of various chapters.

The increasing significance of wetlands in the context of biodiversity conservation at the Mandlanzini Area cannot be under-emphasized. The Mandlanzini wetlands and related resources management options, the mounting attention to benefit-cost analysis of these resources, have become important in this research study. We can therefore conclude that the overall

study is aimed at contributing to the betterment of lives of the people and communities of the Mandlanzini Area. Such improvement can be achieved through the involvement and participation of the Mandlanzini people in decision-making processes in matters concerning wetlands in their area.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

The aim of this chapter is to review the literature on wetlands utilisation and its socio-economic impact on the surrounding communities. The historical background of wetlands conservation is used to develop a conceptual understanding of how wetlands restoration has become apparent worldwide. This historical analysis enables an exploration of significant important considerations that have recently characterised most wetlands in South Africa and the rest of Africa. The first section of this chapter introduces the brief overview of wetlands historical development and its importance. The second section details the nature of public participation in wetlands management in South Africa.

The third section reviews the implication of environmental education on wetlands restoration and its value towards conservation of wetlands. Issues relating to legal and policy implications of wetlands management are reviewed extensively, for example Agenda 21, the Ramsar Convention, National Environmental Management Act, Environmental Conservation Act, Conservation of Agricultural Resources Act and Southern African experiences (Tamura, 2000):. The last section of this chapter relates the economic approaches to wetlands management and the role of wetlands indigenous knowledge, adaptation and sustainability towards wetlands restoration.

Fundamentally, the main aim of this chapter, designated as the theoretical framework, is to overview some of the related literature and principles associated with wetlands, their biodiversity elements and their utilisation and development in the study area. In this regard, literary sources connected with the principles and philosophies of wetlands development and utilisation, are explored and described in this section.

2.2 HISTORY OF WETLANDS CONSERVATION

Wetland restoration has come of age since the 1970s, when the importance of the conservation of the wetlands of the world became apparent worldwide. Since then, many wetlands have been created or restored, typically without attention to the importance of natural disturbance in landscape settings (Middleton, 1999). Historically, wetlands have been considered as sites for undesirable natural plants that spread human diseases, the home of predators and parasites and places where crops do not grow. Wetlands have therefore been considered as areas with little or no value (Middleton, 1999). With advances in water resources management and ecological economics, this view has changed and wetlands are now recognized as providing highly valuable goods and services that contribute significantly to local, regional and national economics. The value of wetlands lies in their supply of goods and services that are consumed by society and their attributes which are equally appreciated by society at large (Palmer, Turpie, Manewich and Batchelor, 2002).

Wetlands are a small but extremely important part of the greater South African landscape. Although South Africa has recognized this by becoming a contracting party to conventions of wetlands of international importance (especially with regard to waterfowl habitat) as far back as 1975, their

conservation has been sorely neglected. It has been estimated that over half of our wetlands have been destroyed and lost. Those that remain are some of our most threatened natural areas. With such heavy losses to a small but extremely important landscape type, it is imperative that a strategy to conserve wetlands is developed. Such a strategy should be based on an understanding of the type and distribution of wetlands in South Africa and the development of a national policy (Cowan, 1995)

Wetlands restoration requires hydrological and morphological rejuvenation so that the restored site mimics its original environment, which then mirrors the adaptive abilities of the target array of plants and animals (Middleton 1999). The main issue in the study was the effect of non-formal education on wetlands restoration. Non-formal education is oriented towards literacy, induction, in-service training, re-training, support programmes (for parents) and a second chance for those who have either never entered the formal system or who have left it early. It is also directed towards the upgrading of individuals with inadequate educational levels so that they can re-enter the formal system, thereby satisfying the demand for leisure time activities that can be carried out with a minimum of preparatory instruction.

Davies and Day (1998) state that the educational potential of wetlands is linked to the possibility of studying natural history and observing botanical ornithological or environmental phenomena and processes firsthand. Work associated with wetlands programmes links various national and provincial governments with the Mondi Wetlands project, an initiative of the Wildlife and Environment Society of South Africa. By virtue of their physical presence and shape and the vegetation they support, wetlands may act as massive hydrological control systems for stream flow (Davies and Day, 1998).

Collective action is important for wetlands restoration both because of the physical interactions among landholders and because of the cost saving and enhanced environmental benefit that can be achieved on a large scale (Hodge and McNally, 2000). According to the Working for Wetlands Programme, everyone depends directly or indirectly on wetlands in responding to the benefits they have acquired. Different strategies for wetlands conservation need to include a combination of proactive measures for maintaining healthy wetlands together with interventions for rehabilitating those that have been degraded (Hodge and McNally, 2000).

By combining environmental and social outcomes, Working for Wetlands weaves together the wise use of wetlands with employment creation and poverty alleviation. Using the rehabilitation of wetlands as a vehicle to achieve these outcomes, the programme follows an approach that centre on co-operation with government and partnership creation with landowners, communities, civil society and the private sectors.

2.3 IMPORTANCE OF WETLANDS

According to Lande (2008) wetlands prevent flooding by holding water much like a sponge. The water is stored in the wetlands and is slowly released to downstream areas, instead of it rushing into the sea within a few days. This greatly reduces flood damage, particularly erosion, and causes a more steady supply of water throughout the year. Environmental watchdog also states that wetlands improve water quality as they are very good natural filters, trapping sediments, nutrients, pollutants (such as heavy metals), pesticides and even disease-causing bacteria. In other words, water leaving the wetlands is cleaner than the water entering it. This is why wetlands are often

compared to kidneys of some animals. Wetlands and kidneys both help to control water flow and cleanse the system. Wetlands accumulate sediments and nutrients; therefore, many plants are able to flourish, e.g. reeds, grasses, lilies, sedges and trees. These plants in turn provide food and shelter for many creatures. There is more life per hectare in a wetland than in almost any other habitat (Mitsch and Gosselink, 2000). Wetlands support huge numbers of insects, birds, fish and other animals. Many animals that live in other habitats use wetlands for migration or reproduction. For example, some birds nest in trees but need shallow areas in order to wade for fish and aquatic life.

According to Lande (2008), the wetlands of the Umhlathuze area are of international importance as they are the southern destination of many migratory wading birds. Lambert *et al.*, (1990) state that wetlands play an essential role in the supply of food for rural communities. During the drought that occurred in Zimbabwe during 1969 – 70, 84% of farmers with "dambo" lands were able to support their family whereas only 21% of farmers without "dambo" lands obtained sufficient yield (Lambert *et al.*, 1990). According Lambert et al., (1990) a dambo wetland is a shallow treeless trough in which water from the interfluves collects during the rainy season. In Peninsular Malaysia, natural wetlands vegetation is not an essential component of the local diet; however, many species allow the local population to survive when agricultural products are in scarce supply.

A socio-economic study of five villages in the Songkhram Valley in the Lower Basin of the Mokong River in Thailand show that the main protein sources are fish (61%) and wildlife of the main Huai Nam Un floodplain. The researchers also note that the villages closest to the wetlands are those where

the problems of protein shortages are the least acute (Choowaen, Chandrachai and Petersen, 1991).

2.4 PUBLIC PARTICIPATION IN WETLANDS MANAGEMENT

Participation of local people in provincial and basin-wide planning is often difficult to organize (Dugan, 1990). One of the common problems is the absence of established groups capable of representing wetlands' dependent communities, as well as a certain resistance on the part of government bodies. Still, it is true that a wetlands' management plan carried out without consulting the local people involved is unlikely to be successful (Dugan, 1990). Choices made when developing such a plan affect the local people. Wetlands-dependent communities should be able to verify that their interests and needs have been taken into consideration. It should also be remembered that local communities are often a major source of information with regard to environmental or socioeconomic problems and can provide crucial insight into problems that affect the capacity of the environment to support source usage, such as deterioration in the normal functioning of wetlands.

2.4.1 Environmental Education and Wetlands Restoration

Environmental education is a combination of many disciplines that enable people to become more knowledgeable about the environment and/or skilled in some aspect of environmental quality. However, environmental education can also be interpreted as being applicable to many other situations, thereby meeting many other definitions that apply to the proposal that learning should bring about connections between science, technology, economics, policy, people and the environment. In general, it may be referred to as education of youth through interpretive programmes at elementary and secondary schools, nature centres and parks and through community programmes.

Although "attainment of knowledge" may meet the strictest definition of environmental education, in most cases the real goal is to develop responsible environmental behaviour and improved environmental quality. In terms of higher education, a complete environmental education enhances critical thinking, problem solving and effective decision-making skills, and teaches individuals to weigh various sides of an environmental issue in order to make informed and responsible decisions for positive action in the degraded environment.

Since wetlands restoration is about bringing sustainability to our environment, non-formal education will a play role in encouraging the inclusion of environmental components in all relevant training and extension programmes, including accredited vocational courses, on-the-job training work, community development programmes etc. Non-formal education makes government and private funding routes and processes more accessible to community-based agencies actively engaged in education for sustainability.

Public awareness of the value of botanic conservatories, arboretums, parks, reserves and gardens need to be raised in order to develop an appreciation for their role and to develop a conservation ethic amongst our communities (http://conserveafrica.org.uk/nat products.html). People are not concerned with the conservation of indigenous fauna and flora unless they realize their value. If this is not done, all efforts will be undermined by the activities of surrounding communities.

2.4.2 The Value of conservation of wetlands

Because wetlands contribute to society, their value needs to be accounted for in development processes. The most effective approach in a world driven by economic growth is to demonstrate the economic value of wetlands, and to

build these values into the planning process so that they receive due consideration. However, certain values are intangible – that is, a monetary value cannot be assigned to them, and there are other issues that make it difficult to estimate value in monetary terms.

The comparison of valuation and opportunity cost results in a cost-benefit framework that can provide valuable guidance for land use decisions when the value of conserving other land uses is not advisable. If, however, the value of conserving wetlands is lower than the opportunity cost, then conservation of the wetlands should be considered further. The results of this partial valuation study suggest that, although conservation of wetlands is generally more valuable than conservation for agricultural use, conservation to mining may often be the most beneficial course of action in the case of most wetlands.

However, it would be incorrect to base decisions solely on a comparison of incomplete total value with opportunity costs. It is also important to compare the correct types of values. For instance, the water storage value of wetlands cannot be considered to be included in the value of conservation.

2.5 LEGAL AND POLICY IMPLICATIONS ON WETLANDS MANAGEMENT

The majority of South Africans still adhere to the basic principles of indigenous or customary law. In terms of the Constitution, indigenous law forms part of the legal system in South Africa. Furthermore, the Constitution recognizes the right to culture, and therefore the right of people to use flora and fauna for medicinal or spiritual purposes. Indigenous laws are based largely on public participation, but they originated from the ancestors, who, it

is believed, tend to reside in rivers and in wetlands. Accordingly, rivers, wetlands, and the theory associated with resources tend to be treated with spiritual reverence and respect (www.mazda.co.za/servlet).

2.5.1 Agenda 21 and Sustainable Development

Agenda 21 is an action plan for sustainable development aimed at integrating economic, social and environmental objectives (Winstanley, 2001). The plan was adopted by more than 178 governments, including South Africa, at the United Nations Conference on Environment and Development in Rio de Janeiro in 1992. The plan recognizes water as a social and economic good with a vital role in providing human needs, food security, poverty alleviation and protecting ecosystems. The overall environmental health objective of Agenda 21 is to "evaluate the consequences of the various users of water-related diseases and protect ecosystems" (United Nations, 1993). High priority is placed on the formulation and implementation of policies and programmes for integrated catchments management, where costs recovery and the equitable and efficient allocation of water is stressed. The UN General Assembly called for a summit to review 10 years of progress achieved in the outcome of the Rio Conference. The summit, called the World Summit on Sustainable Development, took place in 2002 and was hosted by South Africa (Tilbury, 2003).

2.5.2 The Ramsar Convention

The Convention on Wetlands signed in Ramsar, Iran, in 1971, is an inter-governmental treaty that provides the framework for international co-operation for the conservation and wise use of wetlands and their resources [http://www.ramsar.org. (2008)]. The convention is now referred to as the Ramsar Convention on Wetlands. Its mission according to the website is the conservation and wise use of all wetlands through local, regional and national

actions and international co-operation, as a contribution towards achieving sustainable development throughout the world. The National Department of Environmental Affairs and Tourism is responsible for the implementation of the Convention (Cowan, 1995). The broad aims of the convention are to stem the loss of wetlands, to ensure their conservation, and to promote the special protection of listed wetlands. The Wetlands Convention Programme also deals with aspects concerning aquatic ecology under the Convention on Biological Diversity. The programme is aimed at building on past efforts to protect wetlands in South Africa against degradation and destruction, while striving for their wise and sustainable use by trying to ensure that their ecological and socio-economic functions are sustained [http://www. eoearth.org/article/GreaterStLucia WetlandPark.SouthAfrica. (2008)]. .

More recently, a national wetlands rehabilitation initiative was launched under the banner of the multi-departmental Working for Water Programme. The initiative, dubbed "Working for Wetlands", stems from the recognition that efforts aimed at conserving South Africa's biodiversity need to focus on the rehabilitation of degraded ecosystems as well as safeguarding those still in good condition. The focus on Water Programmes recognizes the important role that these ecosystems play in managing the country's water resources http://www.bateleurs.co.za/2008.working-for-wetlands-kzn-north.html.

2.5.3 National Environmental Management Act

According to Winstanley (2001), the National Environmental Management Act (Act no. 107 of 1998) ("NEMA") is an overarching statute regulating various aspects of natural resources use: Integrated environment includes the land and water of the earth: microorganisms, plant and animal life, or a combination of those things and the interrelationships among them (Section 137(1)). Underpinning NEMA is a number of national environmental

management principles that apply to the actions of all organs of State that may significantly affect the environment (Section 2). These principles are therefore the test against which administrative actions that might affect the environment must be measured.

According to NEMA, development must be socially, environmentally and economically sustainable. In this regard, sustainable development requires the consideration of all relevant factors including the following: (a) That the disturbance of ecosystems and loss of biological diversity are avoided, or where they cannot be altogether avoided, are minimized and remedied. (b) That pollution and degradation of the environment are avoided, or where they cannot be altogether avoided, are minimized and remedied. In spite of such measures, many developments lead to the exploitation of renewable resources and the ecosystems of which they are part. Such developments often exceed the level beyond which the integrity of such resources and systems are protected against jeopardy. There is a risk aversion applied that takes into account the limits of current knowledge about the consequences of decisions or actions (Winstanely, 2001).

The negative impacts on the environment and on people's environmental rights must be anticipated and prevented, and where they cannot be altogether prevented, be minimised and remedied. The costs must be paid for remedying pollution, environmental damage or adverse health effects. These costs must be borne by those responsible for harming the environment and the sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands and similar systems. "Water use" also includes altering the bed, banks, course or characteristics of a watercourse (Winstanley, 2001).

2.5.4 Environmental Conservation Act

The environment Conservation Act (Act No. 73 of 1989) ("ECA") was intended to be an overarching piece of legislation aimed at environmental management in the broadest sense. However, it has largely been repealed and replaced by EMA (Winstanley, 2001). Perhaps the most important remaining provisions of the ECA are those concerning the powers of certain officials, the requirements for remediation and the Environmental Impact Assessment Regulations (Winstanley, 2001). In terms of the ECA, the Minster of Environmental Impact, Assessment Regulations Affairs and Tourism is entitled to identify activities that he or she believes may have a substantial detrimental effect on the environment (Section 21). No one may carry out such an identified activity without the prior written permission of a competent authority (Section 22). Permission may not be granted without compliance with (or exemption from) the EIA regulations. The identified activities encompass a number of human/development undertakings that are likely to have an adverse impact on wetlands (see GNR 1182 in Government Gazette 18261 on 5 September 1997). They also potentially include activities that may be undertaken in the rehabilitation of wetlands (Winstanley, 2001).

2.5.5 Conservation of Agricultural Resources Act

According to Winstanley (2001), although the focus of the Conservation of Agricultural Resources Act (Act no. 43 of 1983) ("CARA") is on agricultural resources, it has indirect implications for wetlands, especially insofar as they play a positive role in agricultural activities. This is also one of the primary statutes that have a negative effect on wetlands. Of particular importance are the recently promulgated regulations. The stated object of CARA is to provide for the conservation of the natural agricultural resources of South Africa by maintaining the production potential of land, by combating and prevention of erosion and weakening or destruction of the water sources, and

by the protection of the vegetation and the combating of weeds and invader plants (Section 3). Accordingly, CARA considers as important resources of land, water and related aspects of the veld and the vegetation.

CARA also regulates rehabilitation of wetlands insofar as that activity falls under the definition of "conservation," which, in relation to the natural agricultural resources, includes protection, recovery and reclamation of those resources (Section1). The Minister of Agriculture prescribes control measures with which all land users must comply (Section 6) (Winstanley, 2001).

2.6 SOUTHERN AFRICAN EXPERIENCES

Inland wetlands occur abundantly all over southern and eastern Africa. For example, natural freshwater wetlands cover approximately 6% of the total land area in South Africa. While in some countries the total areas remain unknown because inventories have not yet been carried out or completed, their area is estimated at over two million hectares. In the Limpopo River Basin characterised by climatic extremes, wetlands are important aquatic systems. Because of the abundance of water in wetlands, particularly in the dry season, when compared to the surrounding catchment area they constitute important resources for rural people's livelihoods and perform major environmental functions. Wetlands in the Limpopo River Basin present various characteristics: in the upper catchment they are predominantly *dambos* (seasonally or permanently saturated areas, also referred to as pans), while in the lower catchment in Mozambique there are riverine wetlands along the floodplain. Dambos and pans have significant occurrence in the upper Olifants catchment in South Africa; the Mwenezi, Shashe, Tuli, Umzingwane, and Bubi catchments in Zimbabwe; and the tributaries of the

Changane catchment in Mozambique. Riverine swamps are confined to the main stem of the Limpopo and Changane tributary and the lower reaches of the Limpopo River in Mozambique (IWMI, 2003).

Several studies in southern and eastern Africa (Turpie, 2000; McCartney and van Koppen, 2004; Masiyandima, McCarteney and Kopper 2004) have shown that wetlands and their surrounding catchments support rural livelihoods through provision of a large range of natural resources. These include soils, water, plants and animals that are used by rural households in a wide range of activities such as the making of salt and pottery, plants harvested for use in food, medicines, crafts and for the provision of fuel wood and materials for furniture and house building, hunting and fishing. Apart from harvesting and processing of natural resources, wetlands are also used for the cultivation of crops and for the grazing and watering of livestock. Some of the activities, such as cultivation, fishing and the harvesting of wild foods are clearly economical and are a means of earning income for the household.

Other uses of wetland resources, such as its water for domestic purposes, the soils for decorating houses and its array of wild foods contribute directly to household needs. The contribution of wetlands to the livelihoods of rural households living around them is important: in Zambia and Tanzania, annual incomes from wetlands can be as high as US $1000 per household (90% of the total household income), with high variation across sites and households. Wetlands also take an essential part in food security, especially during the dry seasons or in drought years, when dry land farming, which is limited to the rainfall season, cannot adequately cater for the needs of these households. For example, in Kilombero wetlands in south Tanzania, the wetlands contribute to the food intake of 98% of all the households in the villages

nearby and more than 40% of the households acknowledge using the resources offered by the wetlands as a coping strategy during periods of food shortages (McCartney and van Koppen, 2004). Another interesting feature of wetlands is that they enable a wider range of crops than dry lands, and therefore provide dietary variety and nutrients that are otherwise unavailable among the traditional crops grown in the upland (Masiyandima *et al.*, 2004).

The types of uses and the role that the wetlands play in rural people's welfare vary extensively according to natural settings of wetlands sites, the socio-economic characteristics of the communities and households (especially according to their access to various assets enabling them to harness the wetlands resources) and national historical and political context. This research was expected to show the role that wetlands at Mandlanzini play in the lives of the rural people of this area.

McCartney and van Koppen (2004) identify eight major functions of wetlands. These are for storage of precipitation and runoff, groundwater discharge, groundwater recharge, sediment retention, nutrient transformation, biomass production, maintenance of biodiversity, and chemical cycling. Woodward and Wui (2001) add two other functions: it serves as a habitat for aquatic species and as a habitat for terrestrial and avian species. These functions benefit not only people living on or nearby wetlands but also hold beneficial effects on users downstream. The type and intensity of wetlands uses have potential impacts on these functions. Increasing population is partly due to the resettlement imposed by political regulation (the "villagisation" process in Tanzania) or by the spontaneous immigration of populations attracted by better natural resources. All of these factors have put a high pressure on wetland ecological processes. In some cases, the phenomenon is even worsened by the fact that access to other surrounding

natural areas is now denied to local communities due to their incorporation into conservancies.

The increasing frequency of drought has also driven farmers to extend wetlands areas under cultivation. Several negative environmental impacts of human use of wetlands are reported. These include a decline in soil fertility, reduction of biodiversity, a decline in wildlife population, soil erosion leading to increased sediment load downstream, water pollution due to use of agro-chemicals or due to human and livestock waste, and reduced water quantity on-site (productivity of wells) and downstream (reduced flows and rapidly receding water levels during the dry season). If local populations recognize the effects that directly threaten their livelihoods (reduction of water availability, diminution of water quality, reduction of soil fertility), they generally do not acknowledge the impacts on downstream users (McCartney and van Koppen, 2004; Masiyandima *et al*., 2004).

A major cause of wetland degradation all over the world, and more specifically in developing countries, is precisely the lack of knowledge by government planners, natural resource managers and wetland users of the ecological processes by which wetlands provide their diverse benefits and the ignorance of these benefits themselves. Even in the scientific community, there is a large gap in the understanding of the effects of land and water uses in the wetlands on hydrological processes in the catchments. Previous wetland conservation policies that relied only on protection have shown their limits. Solutions to ensure protection of these fragile environments while maintaining the livelihood benefits to local people need a multi-pronged approach associating all stakeholders, especially local communities, in the decision-making process (Masiyandima *et al*., 2004).

In particular, there is a need for more information on: (a) the monetary and non-monetary value of goods and services provided by wetlands systems; (b) the factors that influence peoples' access to and control over wetlands resources; (c) the social and economic costs of degradation of wetlands, and (d) the quantitative relationships between different agricultural practices within wetlands and the consequent environmental, social and economic implications. The next section of this study examines the characteristics of wetlands goods and services from an economic point of view and reviews the approaches proposed by economic science to address the issues related to these characteristics.

2.7 ECONOMIC APPROACHES TO WETLANDS MANAGEMENT

As emphasized above, wetlands provide numerous natural resources and fulfil a large range of ecological functions. Environmental economists usually distinguish the wetlands characteristics (their biological, chemical and physical features) that are associated with various structures (biomass, soil profiles, fauna and flora communities, etc.) and processes (photosynthesis, transpiration, biogeochemical cycling, decomposition, etc.) and result in ecosystem functions. These ecosystem functions are in turn the support of goods (agricultural and livestock products, fisheries, timber and non-timber products, water etc.) and services (flood control, groundwater recharge and discharge, nutrient cycling, biodiversity maintenance, etc.) that benefit various users (Turner *et al*., 2000). Barbier *et al.* (1997) propose a slightly different decomposition of wetlands into components ("biotic and non-biotic features which include the soils, water, plants and animals") and functions resulting from interactions between the components and attributes, such as diversity of species and cultural heritage. They also emphasise the correspondence between the ecological category of structural components

(regulatory environmental functions) and the economic category of resource stocks or goods (resource flows or services) (Barbier *et al*., 1997).

2.8 CONNECTIONS AMONG WETLANDS FUNCTIONS, USES AND VALUES

Wetlands goods and services satisfy various objectives of different users: food security and cash income (picking, fishing, hunting and agricultural production), health (drinking water and hygiene), recreation and culture (spiritual enrichment, cognitive development and aesthetic experience) (McCartney and Van Koppen, 2004). As shown in Tanzanian and Zambian studies presented in the introduction, users differ along with the type and quantity of wetlands resources they use, their access to these resources (in terms of property rights and physical means of access), capital (including knowledge, which they can mobilize to harness the resources) and their location (on-site and off-site).

Turner *et al.*, (2000) distinguish nine categories of users: direct extensive (intensive) users harvesting wetlands goods in a sustainable way or in a non-sustainable way); direct exploiters (using non-renewable resources such as mineral resources, peat, clay); agricultural producers; water abstractors for domestic and productive uses; human settlements close to wetlands benefiting from their amenities; indirect users benefiting from services such as river flow regulation or water purification; nature conservation and amenity groups, and non users.

Problems and conflicts about wetland uses often arise from the competition between users over the same resources or from the incompatibility of certain uses (e.g. environmental and productive uses). This is complicated by

various market failures associated with the public nature of several wetlands goods and services. These include the presence of negative or positive externalities (e.g. increasing water abstraction in wetlands reducing water availability downstream, agricultural pollution affecting fishery productivity) and absence of clear property rights. Customary laws that used to regulate access to and management of wetlands are now challenged by state or local government authority, which does not always have the necessary means to impose limitations to wetlands access. This may result in conflict among different categories of users. In the Kilombero wetlands in south Tanzania, for example, conflict is reported between cultivators and new immigrant pastoralists. Numerous wetlands services are provided to their indirect users without monetary counterpart: for example, populations located downstream of a wetland can benefit for free from its flood control function without even being aware of this service.

Grimble and Wellard (1997) add to these market failures the non-renewable character of some resources (e.g. peat) or their subtractability (water, wildlife). In such cases, the present appropriation and use of the resource may affect its future availability or production, which lead to possible conflicts between generations. Finally, inconsistencies and contradictions among policies at different levels (from global to local) fail at integrating the multiple objectives of their multiple users. These policy failures can largely be explained by lack of knowledge and information about the essential functions of wetlands and the benefits and costs supported by their different users (Turner *et al*., 2000).

The situation is even more critical in developing countries, where environmental policies are relatively recent and suffer from the poor means allocated to research. Moreover, under-representation in the decision-making

process of poor people whose livelihoods directly depend upon natural resources, such as wetlands, result in coercive resolutions and manipulation by those who stand to benefit from such decisions.

To sum up, problems raised by wetlands management can take different forms, including competition among on-site, direct present users (resource allocation problem); conflicts between on-site direct users and off-site indirect users, and trade-offs between present and future users (intergeneration allocation problem). On-site users have easy access to wetlands resources and can easily measure costs and benefits associated with their goods and services, while off-site, indirect users who benefit from services provided by wetlands have less access to such resources as they are not present on a permanent basis and, in some cases, they are not aware of these services (Barbier *et al*., 1997).

2.8.1 The total economic value of wetlands

As pointed out by Turner *et al*., (2000), the link between wetlands functions and wetlands uses is essential in order to proceed from ecological characterization of wetlands to an evaluation of their economic worth, since economic values depend on the preferences of people and on what they perceive as the impact wetlands have on their wellbeing. These perceptions may vary over time and across sites. Therefore, wetlands' functions do not necessarily have an economic value if such functions are not subject to user demand. Economists define the Total Economic Value (TEV) of a wetland as "the total amount of resources that individuals would be willing to forego for an increased (or preserved) amount of wetlands services" (i.e. their willingness to pay). Several components of TEV are generally considered: direct (respective indirect) *use values* arising from direct (respectively indirect) uses of wetlands goods (respective services); and *no- use value*

associated with the existence or maintenance of a resource, such as an individual species or an entire wetland, and not related to its use. In addition, *option value*, which is associated with use values, refers to the benefits derived by an individual from ensuring that the resource will be available for future use (Turner *et al.*, 2000; Barbier *et al.*, 1997).

Turner *et al.,* (2000) emphasise that in order to avoid double counting it is important to value the functions performed by wetlands and not the individual goods and services, as one function can contribute to several goods and services. They also point that TEV, which is derived from an assessment of individuals private values, may not reflect the social value of the ecosystem, since some goods and services might be incompatible. Moreover, some environmentalists adopt a radically different philosophical position and defend the idea of a pure intrinsic value of nature, which is completely disconnected from the anthropocentric economic values. Confronted with the diversity of stakeholders' objectives and interests and the high potential for conflict among them, decision-makers are seeking for decision-support tools that allow an integration of the various wetlands values and an analysis of possible tradeoffs among them.

2.8.2 Costs-Benefit Analysis (CBA)

Cost-benefit analysis (CBA) has been widely used for project assessment in a large range of sectors. Its adaptation to wetlands management related problems requires resorting to non-market valuation techniques, as most of wetlands goods and services are not subjected to monetary transactions. Different valuation techniques may be used to assess the different categories of wetland values. The market prices method is used, at least partially, for wetlands goods that are traded at markets. Turpie (2000) employs this method for valuing various natural resources harvested in the Rufiji

floodplain and delta in Tanzania, which includes salt, clay used for pottery, grasses, sedges and reeds used as construction materials, palm tree products, poles and timber, fish, game and wild honey.

Some direct use values (for resources harvested for own use by households) and all indirect use values and non-use values are assessed through non-market valuation methods. These include the contingent valuation method, travel costs method, or hedonic pricing method. For a detailed description of these methods, see Freeman (2003). Woodward and Wui (2001), in a meta-analysis of wetlands services evaluation, identify five techniques typically used to quantify the value of ten categories of wetlands functions. They note that the majority of existing works value only one service, while 30% value three or more services. Few studies examine the valuation of wetlands in developing countries: typically only two works out of 76 that were analyzed by Woodward and Wui (2001) concerned wetlands in a developing country. Barbier (1994) estimates that some of the key direct values to the population of the floodplain of Hadejia-Jama in Nigeria are fishing, crop production and fuel (wood). Barbier and Strand (1998) assess the shrimp value for commercial fishing in the coastal wetlands of Campeche, Mexico, using a net factor approach.

Acharya and Barbier (2000) apply a production function approach to value the groundwater recharge function of the Hadejia-Nguru wetlands in Northern Nigeria (see also Acharya, 2000). Ruitenbeek (1994) evaluates different uses for a mangrove swamp in Bituni Bay, Indonesia, which includes woodchip production, the shrimp export industry and non-commercial uses by the local population. He also evaluates the benefits of erosion control and biodiversity maintenance functions. As highlighted by Turner *et al*., (2000), it can be concluded that sound use of CBA should take

into account the policy's impacts on provision of goods and services with regard to wetlands, and thus be based on a detailed knowledge of wetlands functioning, which is often imperfect and qualitative in nature. A major difficulty in applying CBA is the insufficient information on important ecological and hydrological processes that underpin the various values generated by wetlands. This clearly calls for an integrated modelling of the links between wetlands ecology and wetlands economy**.** According to Woodward and Wui (2001), apart from the significant data requirements of CBA, there are several other disadvantages to CBA, as emphasised by several other authors. Based on an economic efficiency criterion, CBA does not consider the distribution of benefits and costs among stakeholders and is contingent on the existing distribution of income and wealth. It also tends to omit outputs for which effects cannot be quantified (Barbier *et al*., 1997).

Antle, Stoorvogel, Bowen, Crissman, and Yanggen (2002) question two basic assumptions of CBA: the discounting over time of all benefits and costs and the valuation of all effects in monetary terms. The former leads to a reduction of the weight of future outcomes relative to present outcomes, which is often misunderstood by the general public and can be viewed as contradictory to a sustainability objective. Some members of the society may reject the latter on the grounds that human life or environmental amenities are incommensurate with monetary income. Moreover, stakeholders may fail to represent cognitively values in monetary terms for non-monetary aspects of goods and services (Gregory and Slovic, 1997). This aspect is of particular importance to societies largely based on non-market relationships, as in the more remote rural areas of poor countries. All these economically based principles may contribute towards the effective and sustainable use and management of wetlands. This study is in a significant way, aiming at addressing the problems associated with wetlands maintenance.

2.9 THE ROLE OF WETLANDS IN CONTROLLING EROSION

Wetlands play a functional role in erosion control along water channels and their tributaries. In particular, wetlands have filtering capabilities for intercepting surface water runoff from higher land as the runoff approaches coastal waters. As runoff water passes through, the wetlands retain excess nutrients and some pollutants, and reduce sediment that would clog waterways and affect fish and amphibian egg development. Wetlands also provide natural flood protection by acting as sponges to absorb excess water (Mitsch and Gosselink, 2000).

In addition to erosion control, wetlands offer a number of valuable environmental benefits along the shores where they occur naturally. Boyland and Maclean (1997) have estimated that 46% of the nation's endangered species live in wetlands or are wetlands-dependent (as cited in Whigham, 1999). Wetlands provide a habitat to thousands of animals and plants in addition to providing stopping points for migratory birds. They are diverse and dynamic ecosystems teeming with a biodiversity that includes fish, wildlife and plants of economic and social value. Because of their unique ecosystems, wetlands provide aesthetic and recreational opportunities for millions of people and communities. Examples of such recreational activities include hunting, fishing and bird watching (Boyland and Maclean 1997).

The ability of the wetlands to control erosion is so valuable that artificial wetlands are being constructed along coastal areas to buffer the storm surges from hurricanes and tropical storms. Wetlands at the margins of lakes, rivers, bays and the ocean protect shorelines and stream banks against erosion. Wetland plants hold the soil in place with their roots and absorb the energy of waves; they also slow the flow stream of river currents along the shore

(Mitsch and Gosselink, 2000). Utilizing wetlands in erosion control can therefore help to satisfy a broad range of goals to the benefit of man and nature by maintaining the integrity of the shoreline and simultaneously enhancing the Wetlands ecosystem.

2.10 INDIGENOUS KNOWLEDGE, ADAPTATION AND SUSTAINABILITY

It has been recognised in recent years that Indigenous knowledge (IK) is making an important contribution to natural resource management systems, particularly in the developing world (Brokensha *et al*., 1980; Richards, 1985; Warren *et al*., 1995). Central to this recognition, is the assertion that IK is dynamic and that, as it evolves over time within a particular culture, local communities possess the capacity to adapt to changing circumstances (Cambers, 1983). Possessing such knowledge and possessing the capacity to adapt and apply it in the face of changing environmental or socio-economic conditions, in other words the 'social resilience' of a population (Adger, 2000), is essentially the root of sustainable natural resource management. Hence, IK is in many respects regarded as a panacea for rural development across much of the developing world. Recognising, empowering and incorporating IK, particularly in rural development projects, is considered as a means of ensuring socially, environmentally and economically sustainable natural resource management.

Not all natural resource management strategies based upon traditional indigenous knowledge are, however, sustainable. A shift from sustainable to unsustainable natural resource management can occur when environmental or socio-economic change proceeds at a rate that exceeds the capacity of communities of individuals to develop their IK, adapt their management

strategies and cope with change (Ferrington and Martin, 1988, Grenier, 1998; Adger, 2000). Understanding how this adaptive capacity functions and how it is influenced is fundamental to understanding the relationship between IK and the sustainability of natural resource management.

A wide range of factors at various levels influence adaptive capacity, not least the nature of the changing circumstances themselves. From an IK perspective, adaptation depends upon the acquisition of new knowledge and the application of this knowledge. The mechanisms through which IK is acquired or developed have been the subject of research in recent years. Attention has particularly been focused on the role of farmer innovation and experimentation in the development of IK (Richards, 1985; Chambers *et al*., 1989; Rhoades and Bennington, 1995), while less research has been undertaken on the transfer of IK through indigenous communication channels (McCorkle and McClure, 1995; Mundy and Compton, 1995).

The traditional view held by many scientists is one of farmers being adopters of technologies introduced from the outside, with innovations arising through accidental and unsystematic practices (Moris, 1991). The logic behind this assumption has been that any deviation from existing methods entails a high risk (Schultz, 1994). Johnson (1972) was one of the first researchers to contest this traditional view of agriculture, maintaining that experimentation and risk are separate matters. Farmers can be cautious when faced with innovations but rarely do they refuse to try them out. Johnson (1972) goes on to argue that farmers' experimentation in many instances is an adaptive response to ecological variation, although this is by no means a passive or uniform process. By response to environmental changes each farmer contributes to the complexity of the knowledge system so that a critical degree of individuality is found in the knowledge base of farmers.

Richards (1985) describes several examples of experimental practices in rice farming among the Mende farmers in Sierra Leone. These farmers have areas of land reserved exclusively for experiments with rice varieties. In addition, rice is often planted in marginal areas, such as the inter-zones between swamps and uplands, to test its tolerance to harsh conditions. Depending on the results, it can be tested again either upslope or further into the swamp. Richards (1985) maintains that this is all part of a process of indigenous experimentation, which is designed through flexible research to minimise the risks involved in environmental uncertainty.

Rhoades and Bebbingtone (1995), in their investigation of experiments undertaken by Andean farmers in the cultivation of potatoes, identified the existence of three types of experiments. The first, curiosity experiments, are carried out when a farmer wishes to test an idea that comes to mind. Secondly, problem-solving experiments occur when farmers seek practical solutions to old and new problems and such experiments are common in areas with diverse agriculture and poor extension services. Finally, adaptation experiments may be carried out by farmers after they have acquired new knowledge or technology. These operate in three contexts:

(a) when farmers are testing a new technology or idea in a known environment;

(b) when farmers are testing old technology or an old idea in a new environment;

(c) when farmers test an unknown technology.

In addition to these types of experiment, Millar (1993) describes the existence of peer pressure experimentation among farmers in northern Ghana. This occurs when experimentation is initiated because of religious or cultural

beliefs that see agriculture embedded in nature. Experimentation is equated with having respect for land, as it is believed that enthusiastic farmers who demonstrate originality are more likely to be rewarded with higher yields than those who repeat old experiments.

A key issue raised by Rhoades and Bobbington (1995) in their classification of indigenous experimentation is that of the acquisition of knowledge. Whilst the majority of IK research casts doubt on the capacity of farmers to generate and develop their own knowledge through experiments, it is perhaps equally significant to note that IK provides the channels through which farmers acquire and communicate their knowledge. Whereas IK is created in the minds of individuals or communities as a result of their perceptions of the environment, communication in the process enables people to create and disseminate new knowledge (Mundy and Compton, 1995). According to the literature, IK tends to be communicated through events such as storytelling, village meetings and folk drama (Wang, 1992) in contrast to 'western' knowledge, which is characterised by telecommunication systems, the mass media and government officials. Generally, indigenous communication systems are developed locally, are under local control, use low levels of technology and are characterised by lack of bureaucratic organisation (Mundy and Compton, 1995).

McCorkle and McClure (1995) highlight a range of indigenous experimentation and innovation among Sahelian farmers in Niger, noting that farmers in remote areas were equally as innovative as those in densely populated areas. Their research suggests that farmers place a much higher degree of credibility on the information they receive from fellow farmers than from extension agents, especially when knowledge appears to have been well tried and subsequently adopted. Wang (1992) reports a similar situation in

Java, where farmers with rich agricultural experience gain respect from fellow farmers who willingly accept recommendations and information on farming practices. In McCorkle and McClure's (1995) study, western forms of communication, such as the mass media and television, were identified as playing some role in alerting people to new agricultural possibilities, but interpersonal and group communication, and even direct observation, was found to be more significant in stimulating innovation. The farmers in the study freely admitted that, as sources of information, agricultural extension agents with technical information were not relevant to their needs.

A key theme to emerge from such studies is that IK tends not to be shared equally throughout a society. Differences can occur as a result of gender, age, experience and profession (Swift, 1979). Mundy and Compton (1995) suggest the existence of several groups of people who contribute to the development and communication of IK in different ways. These include:

(a) Indigenous experts who are skilled in areas such as crop production: these individuals are sought for advice on farming and other matters;

(b) indigenous professionals who are experts in indigenous knowledge and skills not widely distributed in society. These may include healers, blacksmiths or irrigation system builders;

(c) innovators who deliberately experiment and develop new knowledge;

(d) intermediaries who include those responsible for informing members of society about new ideas of development; and

(e) recipient disseminators, who are individuals who receive new information and then react to it before passing the knowledge on.

These indigenous communication mechanisms are highly significant in the adaptation and evolutionary process of IK systems and they form components of community social capital, i.e. the shared social societal values, norms and networks, which enable people to act collectively (Woolcock and Narayan, 2000). Consequently, unlike most exogenous communication channels that are met with scepticism on the part of farmers, they are regarded as highly credible sources of information that are significant facilitators of innovation and change. Their importance in facilitating adaptive capacity, hence socially sustainable natural resource management through information exchange, is therefore, paramount. Furthermore, their importance within rural development exchange is considered to be of more value than 'traditional' forms of extension services that tend to be dominated by exogenous communication channels.

2.11 CONCLUSION

In conclusion, the study literature review highlighted also the historical background of wetland conservation to review where wetland comes from and where it is now. The historical of wetland tells all about the importance of wetlands as it reduces flood damage like soil erosion and cause study supply of water throughout the year. As wetland are important it also true that public participation when discuss about issues on wetland management are so crucial since local communities are major source of information with regard to socioeconomic problems.

The effective public participation is the one with attainment of knowledge". In the literature it shows that environmental education is the key to ensure wetland sustainability.

- EE teaches individual to make informed and responsible decisions for our environment.
- Education on environment also teaches legal and policy implications of wetlands. The legal implication of wetland management include- Agenda 21, Ramsar convention, NEMA, Environmental conservation act, and conservation of Agric Resources.
- The literature shows that managing wetland has economic approach since ecosystem functions are in turn the support various users.
- As the study conducted in a developing world, it is making a significant contribution to natural resource management.

CHAPTER THREE

RESEARCH DESIGN AND METHOLOGY

3.1 INTRODUCTION

This chapter focuses on the research design and methodology procedures used in this research study. The chapter begins with a discussion to unpack the qualitative and quantitative research design and methodology. This section also incorporates the relevant instrumentations that were used to collect and analyse data. Included also in this section are the details of the population selected for the study, a description of respondents, sampling procedures, data collection methods.

3.2 FIELD SURVEY DELIMITATION

This study was conducted at Mandlanzini, to the North of the Richards Bay area, which falls under the uMhlathuze Municipality in the North Eastern coastal part of KwaZulu-Natal. As shown in Figure 1.1 Mandlanzini is semi-urban to rural area located on the north eastern side of Richardsbay and most of the data was collected in this area.

3.3 RESEARCH DESIGN

In executing this research investigation both the qualitative and quantitative research methods were used to collect data from the study area. The research design as a whole also included the following techniques: experimental design, research instrumentation, sampling procedures, interview technique, method of data presentation, methods of analysis and interpretation.

3.3.1 Qualitative research

The qualitative research method is defined as a research method that involves an in-depth understanding of human behaviour and reasoning that govern human behaviour. This method was employed in order to ensure that most people in Mandlazini area would be involved in the data collection process. The study involves investigation of the socio-cultural impact of the people of Mandlazini regarding their use of wetlands as well as how they employ indigenous knowledge in order to restore the wetlands.

The goal was to gain insight into the populations' perception and understanding of wetlands restoration from their own perspective. Participants were able to express their meaning in words and to relay their personal experiences with regard to the wetlands. In accordance with the qualitative research method, observation allowed the researcher to observe people's activities within their natural setting, in this case the Mandlazini area. This resulted in an understanding of their daily interaction with and behaviour towards wetlands. The researcher's observation of wetlands users prompted him to ask questions about the common crops that they usually plant in the wetlands and the methods followed in doing so. Since people were more than willing to talk about their personal experiences, the researcher asked what kinds of indigenous knowledge they made use of to restore the natural resources.

The qualitative research method makes use of data from observation consisting of detailed descriptions of participants' behaviour, staff actions and the full range of human interactions observed in the field. The researcher made use of qualitative research to determine the socio-economic impact of non-formal education on sustainable use of the wetlands. In this particular area, no studies involving the opinions of respondents with regard to

education about wetlands and the activities carried out in them had been conducted before in the South African context. The questionnaire administered to them contained several questions related to socio-cultural activities, the attitude of people towards wetlands uses and indigenous knowledge construction and its influence on the use of wetlands.

Qualitative research methods were used primarily as a prelude to quantitative research. These were used to define problems, generate a hypothesis, identify determinants and to develop quantitative research designs. The approach was direct and it discloses the purpose of the study and the organisation that commissioned it.

3.3.2 Quantitative research

Burns and Grove, (1993) defines quantitative research as a formal, objective, systematic process in which numerical data are utilised to obtain information about the world. Therefore, objectivity, deductiveness, generalisability and numbers are features often associated with quantitative research. Quantitative research can be used to test hypotheses such as, "about 80% people without non-formal education do not restore wetlands." The research results can then be generalised and the data can then be structured in a form that can be immediately transposed into numbers. In this study, the quantitative method was used to generalise the age of people using wetlands and to analyse the gender of the users of the wetlands.

3.3.3 Experimental design

This study examined variables in their natural environment and avoids researcher-imposed treatment. The paradigm for the scientific method in research is the true experiment or randomised control trial. Three essential elements of experimental design were used in the study:

(a) **Manipulation**: The researcher does something to at least some of the participants in the research.

(b) **Control**: The experimenter introduces one or more control mechanisms to the experimental situation.

(c) **Randomisation**: The experimenter assigns participants to different groups on a random basis (Pilit and Hungler, 1997).

These three elements of experimental design were applied in a less rigorous manner in this study, and some are explained later in this chapter.

3.3.4 Quasi-experimental design

A quasi-experimental design was developed to provide alternative means for examining causality in situations that are not conducive to experimental control. The design developed for this study is used to control as many threats to validity as possible in situations where at least one of the following three elements of true experimental research is lacking, namely manipulation, randomisation, control or control group.

3.3.5 Descriptive design

Descriptive design is aimed at gaining more information about particular characteristics within a field of study. The descriptive study may be used to develop theory, identify problems with current practice, justify current practice, make judgments or identify what others in similar situations may be doing.

3.4 RESEARCH INSTRUMENTATION

The primary data was collected from respondents by means of interviews and structured questionnaire sheets. Pilit and Hungler (1997) define the interview as purposeful conversation, usually between two people, that is directed by one in order to get information. Burns and Grove (1993) state that the

questionnaire is generally regarded as a form distributed through the mail or filled out by the respondent under the supervision of the interviewer. Face-to-face interviews were conducted to assist those who are illiterate and the digital camera was used to take photos for evidence. The interviews were conducted in isiZulu to facilitate translation into English on the questionnaire sheets, which were written in English. As the majority of the local community was not literate, the researcher asked some questions directly and wrote responses on the questionnaire sheet.

The researcher observed the wetlands area together with the respondents. During the observation process of data collection, the researcher asked the respondents to state the methods that they used for planting in the wetlands. The researcher took photographs of various activities showing how people were engaged in wetland usage. Most of the respondents agreed to have photographs taken of their activities.

3.5 THE INTERVIEW TECHNIQUE

For purposes of collecting data in this research investigation, a structured interview schedule was used because of the following inherent advantages:

- It allows research to be conducted among people who cannot read and write.
- Avoids misunderstanding of questions because clarification of the question can be elicited.
- The interviewees can explain their answers.
- It provides flexibility because ideas can be explained.
- Some people are better able to explain their views orally.
- Questions are treated independently.

These advantages encouraged the researcher to follow this research interview method, both with open-ended and closed-ended types of quations.

The interview techniques also have some disadvantages, and according to Kabudi (2004) the following are very obvious: More time, money and energy are required to conduct interviews. The interviewer may elicit a degree of bias in the responder. The race, age, sex, religion, vocabulary, accent, ethics background or social class of the interviewer may alter the responses of the respondents. Several extraneous factors may contribute, in part, to variations in a set of findings; some of these are an increase or decrease in the fatigue, boredom, or recording skill of the interviewer; his/her knowledge of the hypothesis being tested or of early data returns, and the subtle but unconscious visual or vocal cues that the interviewer may give to respondents. Interviewers' opinions, attitudes, and their expectations of the respondents' opinions and attitudes may influence whether and/or what answers are given, as well as whether and how they are recorded.

Since many people in the Mandlazini area cannot read and write, the researcher used the vernacular (Isizulu) to facilitate understanding of the questions. People were better able to explain their point of views orally, and that was witnessed when most respondents explained the way they understood the term "wetlands." Although the questionnaire included questions on education about wetlands, the respondents chose not to respond to these – and they explained that they had received no education in this regard. Problems such as misunderstanding with regard to the questions were overcome by conversing with the respondents in their own first language.

3.6 METHOD OF DATA PRESENTATION

Questionnaires were presented to the respondents by means of face-to-face interaction. Kabudi (2004) recommends that questionnaires should be presented face-to-face in order to get in touch with respondents. This

strategy helped in giving them clues to questions that they did not understand, since most of the respondents were illiterate. In this study, the researcher opted to use the face-to-face approach because it helped to solve the language barrier and gave the researcher a better opportunity to help the participants reach an understanding of the purpose of the study (See Appendix A and B).

Secondary data was obtained from research journals and articles on wetland usage from various publications. Some brochures and reports on wetland usage were accessed at the Department of Agriculture and Environmental Affairs at Empangeni and Richards Bay. Most of the pamphlets from these two departments were helpful, since they specialised in the field of wetland usage. Internet websites also supplied relevant material. Information provided by municipalities was also useful as the study area falls within a municipal area. In addition to these sources, information obtained from archives was also used in the study.

3.7 SAMPLING PROCEDURE

The study also made use of networking or snowball sampling and comprehensive sampling. In snowball sampling, each successive (following) participant is named by the preceding (previous) participant. The researcher asked each participant to suggest other particular participants that may have information or knowledge about the research problem. This helped the researcher to work with relevant participants with knowledge and to obtain relevant information. This sampling technique also helped the researcher to save time by avoiding interviews with irrelevant people. It enabled the researcher to obtain directions to find other respondents, since the sites were located close together and it was difficult to move from one point to another

without guidance. Comprehensive sampling was used instead of sampling the entire group. If an entire group is selected, every participant, group or other source of relevant information must be examined. Comprehensive sampling ensures that unit sampled is heterogeneous and of a manageable size. The research sample comprised 240 respondents emerging from 40 households at an average of 6 persons per household [Refer to Table 4.1].

3.8 THE ANALYSIS OF DATA

The responses received from the interviews and the findings from observations and documents were analysed using the content analysis method that group data into relevant categories (Kerlinger, 1986). As soon as the information was collected, it was presented, analysed and interpreted immediately. Frequency-percentage tables, graphs and cross-tabulations were used to present the analysed data. As intimated earlier the questionnaires were analysed quantitatively using the Statistical Package for the Social Sciences (SPSS). The study therefore, used a combination of qualitative and quantitative research methods. The resultants statistical outcomes assisted the researcher with the interpretation of the results, and drawing conclusions about the objectives study.

3.9 ETHICAL CONSIDERATIONS

Burns and Grove (1993) define ethics as the branch of philosophy that pertains to the researcher's conduct, and serves as a guide to behaviour in this regard. The researcher ensured that the rights of all participants (interviewees) were respected, and in particular the right to non-disclosure of identity. The interviewer carefully explained to the interviewees their right not to disclose their names and that they did not want to feature in the study,

their real names would not be used. Pseudonyms were therefore used in order to protect the rights of participants. The participants were also informed that the information collected from them would be kept at the University of Zululand library as a resource. They were told that they had the right not to respond to questions if they did not want to do so. Most of the respondents completed the questionnaires without any hesitation. The researcher explained to the respondents who wanted to know how the information would be used, that it would be kept in libraries for future use.

3.10 PROBLEMS ENCOUNTERED IN THE STUDY

The study was not funded, which meant that the researcher had to make use of personal finances to conduct all of the activities necessary for the research. This included transport to the research area, photocopying of papers for questionnaires, transport to the computer laboratory at the University of Zululand for typing of questionnaires and to gain access to other tools used in the study as a whole. Data collection for the research took place in the daytime, when most of the targeted interviewees were absent from their homes and working on the wetlands. The researcher often had to seek assistance from anyone available in the vicinity of the homes or from passers-by in order to find the targeted respondents.

Some respondents believed that the study was intended to prevent them from using the communal wetlands. The researcher then had to explain the main aim of the study. Some of the respondents were unable to read the questionnaires and the researcher had to make use of their home language in order to help them understand. Others wanted to know what they would be getting in exchange for the information before they were willing to answer the questions. The researcher explained that, apart from gaining information,

they would benefit by the fact that the study would help to make the government aware of their problems.

3.11 CONCLUSION

In this study the methodological procedures of collecting data, analysing it and presenting it, were presented using various techniques. To achieve these research methodologies this chapter has put in place procedures which would help in addressing appropriate objectives, so as to reach the necessary research conclusions.

It should be understood that qualitative and quantitative approaches in analysing data pertaining to investigating the impact of socio-economic factors and indigenous knowledge on wetlands utilisation in Mandlanzini, should be executed in a proficient manner. It is also anticipated that the objective regarding the proposed recommendations for the future implementation of strategies relating to the management of wetlands conservation, would be realised or achieved.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 INTRODUCTION

The collection of information on the socio-economic conditions of Mandlanzini is intended to facilitate an understanding of how users' livelihood affects the available resources of the wetlands. A deep logical understanding of the socio-economic status of the community was necessary to assist in the assessment of whether to devise means that call on the utilisation of indigenous knowledge for sustainable livelihood or for other, technological means. This part of the study sets out to establish whether the community of this area depended on the existence of the wetlands for survival or not. The following section deals with the findings of the study in multiple perspectives. Firstly, the profile of the surveyed respondents is presented. Then an in-depth critical analysis of the livelihood strategies of the two communities is carried out. The focus of attention then shifts to the socio-economic status of the community under study.

4.2 SOCIO-ECONOMIC STATUS

The demographic and socio-economic aspects of the community surrounding the wetlands resources in the two selected Phases at Mandlanzini are presented in Table 4.1 and in Figures 4.2 and 4.3 respectively. Population, number of households, average household size and percentage of the respondents based on the sex of the interviewed community members is presented in Table 1. The two Phases accommodate, on average, at total of 500 households (Stats-SA, 2003). The highest household size is seven

persons per household. In all the surveyed Phases, more females were interviewed than males since females were more physically involved in the wetlands activities than males. It is for this reason that there is always a call to involve women in development activities in the rural areas.

TABLE 4.1: DEMOGRAPHIC STRUCTURE OF THE SURVEY AREA

Village Name	Number of Households	Average household size	Frequency	% Respondent	
				Male	Female
Phase 1	20	7	140	40%	60%
Phase 6	20	5	100	35%	65
Total [2P]	40	6	240	35%	65

In terms of ethnic groups living in the Mandlanzini area, the majority of the people are indigenous Zulu speakers. However, a substantial number of Mozambican nationals work in the wetlands as labourers. There were, respectively, 20 respondents in Phase one and 20 in Phase six of the two Phases where the study was carried out. The implications are that, of the sampled respondents, more than 30 percent of the population in the study area originates from outside Mandlanzini. The main reason for the influx into the area may be because the national policy allows that any person is permitted to live anywhere in the country provided that he/she does not break the law of the country. These people appear to have been pushed by circumstances beyond their control; hence, they have developed an interest in the subsistence agricultural activities of the wetlands for survival. Most of the interviewees were crop farmers and livestock keepers who had moved closer to the wetlands in search of pastures for cattle grazing purpose and water and arable land for a sustainable livelihood.

The presence of a multiplicity of ethnic groups in the area indicates that the utilisation of the natural resources in the existing wetlands is not protected by culture. It is not surprising that each individual tribe has its own cultural approach to the use of resources, management and conservation. Thus, the implication is that communities in the area, regardless of their culture, should form a strong union so as arrive at proper strategies for wetlands utilization and conservation that are not dominated by ones tradition, but by issues of sustainable usage of the wetlands. This is important, because if each tribe continues to practice its own culture in wetlands utilization and management, a number of contradictions may come to fore, as each tribe has its own cultural way of looking at things. In addition, the majority of the people in the study area (about 97 percent) depend on agriculture as their main economic activity. This situation has serious implications for the existing natural resources (and especially for the wetlands) as the resources are subjected to increased pressure.

4.2.1 Age structure

Age is an important variable in relation to the planning of sustainable utilization of resources. Knowing the age structure, one could forecast the future use of the resource base. In the surveyed villages, the age structure shows that there will be an increased utilization of wetlands by the youth in the near future. An analysis of the age structure indicates that about 37 percent of the villagers that responded are in the age group of between 0-18 years; 50 percent falls in the age group of 19-59, which is regarded as the working age group for this community, which is subdivided into young adults [23%] and mature adults [32%], and 8 percent to over 60 years (Figure 4.1). The fact that the age group 19-59 is regarded as the working group suggests that, due to poverty, very few young people (19 to 25 years) in this

community can afford tertiary education. This observation implies a need for more effort to go into planning sustainable utilisation of the wetlands resources, as they have to be used by future generations represented by 37 percent of the population residing in the area. There is an urgent need for an inventory to be taken of the existing biodiversity and wetlands resources and for proper strategies to conserve these resources. Furthermore, a proper management plan must be developed to take into consideration sustainable utilization of the wetlands.

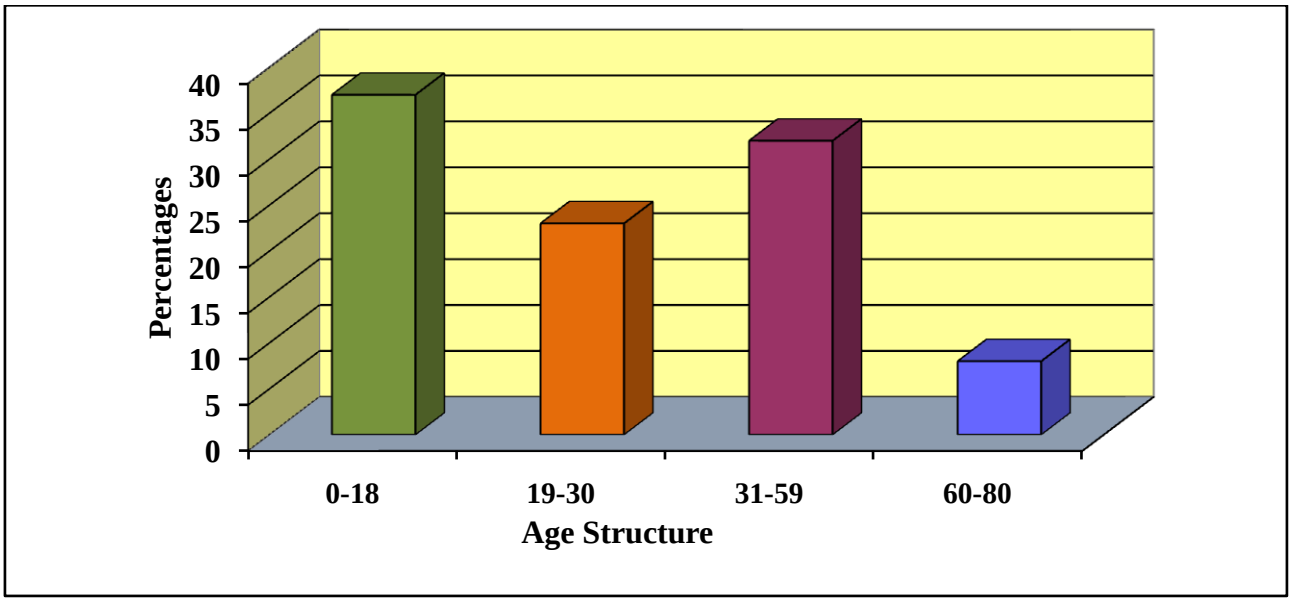

Figure 4.1: Age structure in the selected two villages surrounding the wetlands in Mandlanzini.

4.2.2 Education levels of the respondents

Education has been recognised as an important tool for liberating people from poverty and is necessary for any developing country that wishes to alleviate the lot of such people (URT, 2003). The results presented in figure 2 shows that the majority of the respondents, that is 40 percent, lack basic education, while a significant 32 percent have attained only primary education, which is grade 1 to grade 7 (which is very low by any standard). Very few respondents attended up to secondary level (Figure 4.2). This

indicates that the level of poverty is still very high in the area and that the only means of earning income in the villages is by utilising the existing natural resources available to them, mostly the wetlands resources. Natural and freely available resources are therefore important for poverty-stricken communities, and so is environmental education to help the community conserve its precious resources. This has serious implication for the general usage and management of wetlands biodiversity in the area as almost 74 % of the respondents reported to depend entirely on the wetlands resources for their livelihood.

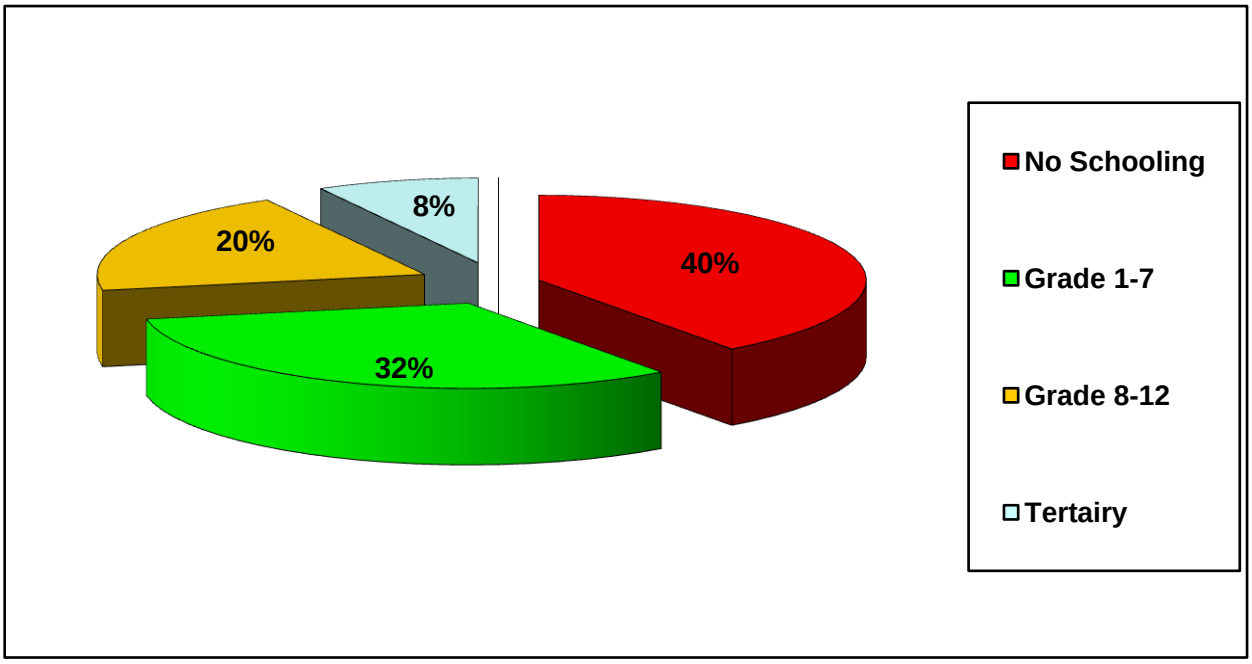

Figure 4.2: Education level status of respondents in the two surveyed villages in Emandlanzini

4.2.3 Households income earned from wetlands products

Given the low levels of education of the respondents, it was not surprising that the main source of income for the households interviewed were crops grown in the wetlands, which accounted for nearly 34 percent, followed by government grants and pensions (27 percent). Sales of wetland crops and petty jobs were the main source of income for poor households. Most of the

households who were mostly dependent on wetlands garden products for food were mostly made up of females in the age group 16 to 90 years. The survey results shown in Table 4.2 illustrate that an average of 25 percent of the respondents in both Phases earn less than R500 per month. Furthermore, it is evident in all the surveyed zones that almost 90 percent of the respondents earn less than R2500 per month. Given the high level of unemployment and low education attainment, many people at Mandlanzini are faced with the difficult choice of either looking for jobs in the surrounding urban areas or working in the wetlands for survival. Education in using modern methods of agriculture to increase their yield would improve the economic status of the respondents. However, modern methods should not alienate effective indigenous methods. The two methods should rather be used in combination to enrich and enhance the agricultural practice of the respondents.

Table 4.2: Monthly income of the surveyed population at Mandlanzini

Income per household	Phase One Village	Phase Six Village
R200-R450	25%	20%
R500-850	30%	25%
R900-R1250	20%	45%
R1300-R2450	10%	10%
RR5000-10000	10%	00%
R10000<	05%	00%
TOTAL	100%	100%

However, there seems to be few alternatives to choose from, as the majority of the respondents rely heavily on child grants and pensions. The fact that a high percentage of the people (about 57 percent) are unemployed, gives rise

to a high poverty rate and a high probability of dependence on the wetlands for the provision of basic amenities. The unemployed people rely on the government child grants [24%] and pensions [33%], which are used to sustain families rather than individuals. On the whole, the data indicates that the population of Mandlanzini can generally be categorised as low-income earners. These two communities show slight disparities in their levels of employment, which is also reflected in their levels of education (Stats-SA, 2003). Due to the high rate of unemployment in the surrounding communities, many people operate small subsistence gardens for daily survival.

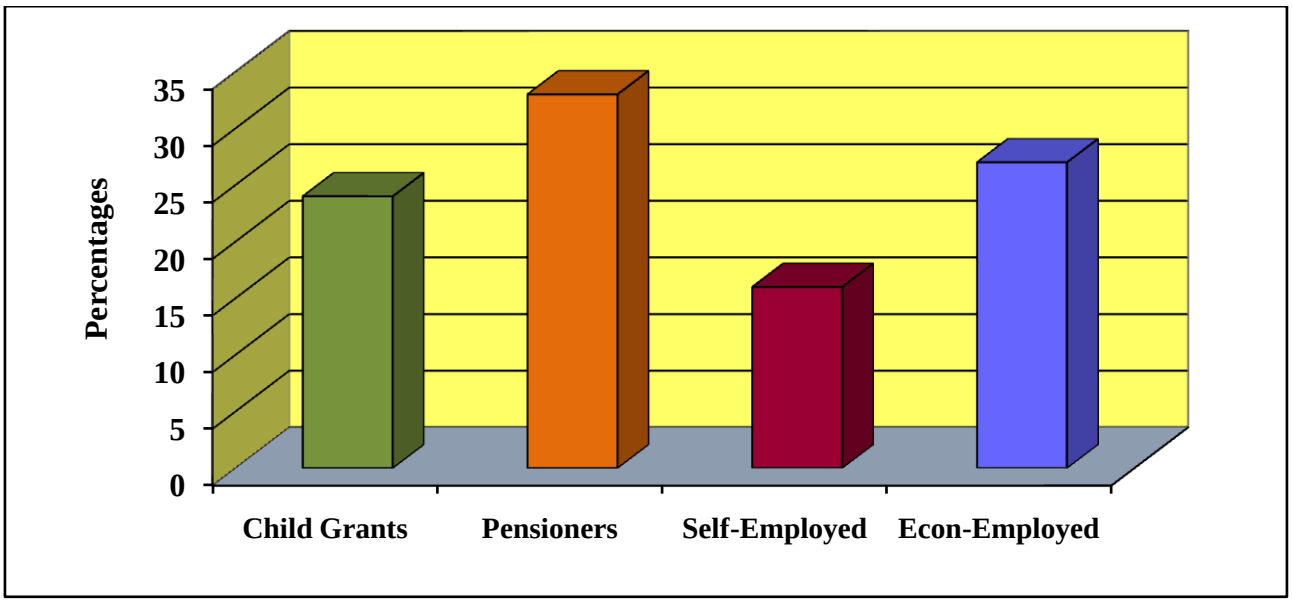

Figure 4.3: The levels of income generation and employment types

It is clear that social grants cannot offer adequate support to the impoverished families; for this reason, it is necessary to find something to supplement available income, especially as female-headed households are predominantly affected – most often having to bear the responsibility of raising the children, mostly of single parents. Indications in Figure 4.3 show that only 16 percent of the people of Mandlazini are self-employed and about 27 percent can be classified as economically employed in Richards Bay and locally.

4.3 THE ROLE OF THE WETLANDS FOR ECOSYSTEM SERVICES

The majority of the residents of Emandlanzini live within walking distance of the wetlands. Some residents have even built mud houses on the wetlands for easy access and for close monitoring of their agricultural products. Wetlands are of great importance to the health of the natural environment in general and essential for the wellbeing of wildlife and forest resources. They are also crucial to the welfare of nature-dependent industries, such as fisheries. Interviews with the respondents revealed the role that the wetlands in question played in ensuring a pristine and unique cultural heritage that is rich in biodiversity. The combination of functions, yields and values makes the Mandlanzini wetlands an important ecosystem.

The most important role functions of the wetlands that are of importance to their livelihood, according to most community members, are on an economic, commercial and socio-economic level. Most respondents interviewed said that the wetlands contained very rich components of biodiversity that were of local, regional and national significance. Among the examples mentioned were different types of flowering plants and vertebrate animals that are found all over the wetlands.

The wetlands in this area play an important role in flood control and in storm surge protection. One respondent pointed out that one of the major reasons he preferred to stay in this area was because he is passionate about environmental protection. In times of intense flooding, the wetlands soak up excess water that holds potential risk hazards. During dry seasons, farmers block water outlets and ditches to conserve water for plants and animals.

People rely on the information released by the radio and TV to update their knowledge in order to deal with wet and dry spell problems. It was fascinating to learn from the respondents that elders in the village can forecast heavy rains as well as droughts. The researcher, however, did not pursue this issue and it can therefore not be reported how the elders accomplish this, or what signs they have to look for in the sky in order to make their predictions. The researcher came to realise how unfortunate it is that our institutions of learning have neglected indigenous knowledge that has been passed down from generation to generation by word of mouth since time immemorial. Like science for the westerners, indigenous knowledge helped the indigenous people to survive in their environment and to explain what is happening in their environment. While scientific explanations are testable, indigenous knowledge explanations are sometimes mystical or spiritual. There has been a revival of interest in indigenous knowledge in South Africa since the democratic dispensation was achieved in 1994. The government realises the importance of recognising and developing indigenous knowledge in South Africa in order to ensure that indigenous knowledge continues to play a meaningful and developmental role in society.

4.4 LIVELIHOOD ON WETLANDS RESOURCES

People who participated in the study have one common voice regarding the wetlands and their livelihood. They attest to the fact that this area is a most productive and resourceful area that provides food and non-aquatic resources but still retains an ecological balance for the local residents in the area. The majority of the people utilize these resources to supplement their pensions and social grants for daily survival since the majority of them are unemployed. Agriculture is rated as the most important activity in the wetlands and as a basic source of income in the area. The counsellor

interviewed by the researcher painted a very interesting picture of how people survive here. "*It is very hard to live around this place when you are a lazy; people converge in the wetlands everyday to earn a living where they share their space.*"

The councillor's view is apparently shared by the attitudes of the people, with most of them demanding draining of water to make more land available for agriculture. The interviews reveal the high dependence of the people on wetlands resources such as *amadumbe* (Colocasia esculenta), thatching material for building houses, bananas and other resources. Although the concept of conservation is well known, in such a scenario the economic conditions of people dictate otherwise. The role of informal education cannot be overemphasised in ensuring that sustainable livelihood methods are practiced in harvesting and the harnessing of natural resources.

Use of the wetlands has united the society in this area since they are familiar with the difficult political tensions that prevailed before attainment of democracy in South Africa. Many of the respondents admit that the wetlands have defined their lives, culture and livelihood patterns over the period of their stay. Due to the availability of a wide variety of harvestable products, people have learned that the wetlands, like other traditionally resources, helps them to be self-reliant and to have a subsistence-oriented economy and livelihood. The wetlands are regarded by many respondents as one of the major sources of their livelihoods, particularly with regard to the cultivation of food crops and pasture.

During the dry season, domestic livestock are allowed to graze in the marshes and turfs. The evolution of the process of their adaptation to this kind of livelihood is usually backed by traditional and indigenous knowledge

systems and on rare occasions it is supported by modern researchers and extension officers.

4.5 CROP CULTIVATION IN THE WETLANDS

The population surrounding the wetlands is purely rural and major parts of the rural area are under various types of wetlands, including floodplains and the lakes in Mandlanzini. About 50 percent of the population interviewed said that they are directly dependent on agriculture for their livelihoods, while many others are declared themselves indirectly dependent on agricultural input, crops and marketing activities in the wetlands areas. Many respondents argued that the high level of dependence on the wetlands for agricultural activities might be because many households have no access to other productive employment in the surrounding industries.

Local people acknowledged the blessing of having vast flooded areas of wetlands that are covered by crops that are able to tolerate water-logging and inundation. Flooding made the soil fertile for nurturing ever-popular underground crops such as *amadumbe* and sweet potatoes, which are planted by many local people at Mandlanzini throughout the year and particularly during the wet seasons. Watermelon, pumpkins and potatoes are among the other crops also grown in the wetlands. In recent years, due to the high level of unemployment in the region, landholders have been heavily engaged in crop cultivation during all seasons. Poor people and landless people from neighbouring counties such as Mozambique and Zimbabwe work in the crop fields as wage labourers or cultivate rich people's land as sharecroppers for earning a livelihood.

Women described how *amadumbe* (Colocasia esculenta), a vegetable with large elephant-ear shaped leaves, is cultivated using a hand-held hoe. This crop is widely grown by many people. Its underground starchy corms consist of small starch grains that are easily digestible. The study found that this crop is common as food for the families. The method of planting *amadumbe* is generally known since it is carried over to the next generation by the grandparents who live in the same place. When one prepares to plant this crop, one must prepare the soil by making furrows to drain the water from the area to be planted.

The young people learn this through non-formal education when their parents assist them in planting such crops. This form of education is practical and hands-on and tends to ensure that learners master the skills that are informally taught. Kabudi (2004), in his paper entitled "The Protection of Intellectual Property Rights of Indigenous Knowledge in Tanzania: Legal Constraints and Challenges," states that indigenous knowledge includes a wide range of knowledge including nutritional, medicinal, agricultural, environmental and spiritual information. All these areas of knowledge are intertwined with indigenous resources, as illustrated in the following section that discusses the usage of the wetlands by the communities of Mandlazini.

4.5.1 Crafts and woven construction from plants

Crafting and woven constructions are still among the most significant cultural and economic activities in the area. Crafters in the area rely on the wetland resources to earn a sustainable living. In general, most crafters still earn relatively small amounts from craft sales, as there is little support from the local community. According to an elder in the village who has been in this business for many years, he is hopeful that things will change one day.

"I started this work when I was a child; those days life was very difficult. My grandmother was very passionate about this work and there was little to earn out of it."

The positive words from the majority of the women in the area bear testimony to the value and satisfaction that local people derive from the craftwork they produce. This observation concurs with Marcus (2001), who found that crafting adds value as a livelihood strategy and compares favourably with income that most rural women generate in formal employment in the existing labour market. The majority of the people involved in traditional craftwork activities are impoverished women, as can be seen in the small amounts that they manage to earn each month (Figure 4.2). Growth in the craft industry will provide improved socio-economic benefits to these women and their households. The efforts of the government at tourism promotion can be seen as a strategy to ensure that there are tourists who will buy the crafts that are produced by communities in rural areas. Recent announcements heard via the South African Broadcasting Corporation (SABC) have emphasised the need for crafters to make quality products that will sell during the 2010 football games to be held in South Africa. Some of the crafts make good mementoes for visitors to take away to their countries to be pleasantly reminded of their visit to South Africa.

Crafts provide a tangible means by which the culture of individuals, families and communities is kept alive and vibrant (Marcus, 2001). Traditional knowledge and skills (e.g. the weaving of specialised food mats *[izitebe])* and traditional practices e.g. giving sleeping mats at weddings) are still conserved and thus the tradition is kept alive. Sleeping mats (singular *icansi*, plural *amacansi*) are one of the customary gifts which the bride gives to the groom's family in a traditional Zulu marriage settlement (see Plate 1). The

gifts are collectively known as *umabo.* According to the passionate female crafters working in the area, the great wealth of indigenous knowledge surrounding the use of wetland plants for crafts production is steadily beginning to fade away, and much of this knowledge has not been formally documented. Promotion of crafts production that remains sensitive to local cultures and skills provides a means of keeping traditional knowledge alive and vibrant.

While requiring skill and dedication, crafting is usually not very strenuous and can be carried out at home. Thus, it is available for young and old alike, the physically challenged, for those caring for the sick, and even for the sick themselves. Besides all of the above socio-economic values of crafts, the production of crafts from wetlands plants has great potential to promote environmental sustainability. Wetlands craft plants are generally well adapted to harvesting and re-grow rapidly following harvesting, especially when harvesting takes place by hand during the end of the growing season (Kabudi 2004).

Most current harvesting takes place in this manner and confirms that indigenous people do have sustainable ways of harvesting reeds. The sustainable production of crafts in the wetlands adds value to wetlands areas that are in a natural state (i.e. “Conservation through Production”). This provides local people with an incentive not to destroy these wetlands areas through artificial drainage and other impacts. The destruction of the wetlands would destroy the very source of valuable raw materials that local crafters depend upon for their livelihoods. Several organizations such as KwaZulu-Natal Wildlife and the Institute of Natural Resources encourage the sustainable harvesting of wild populations of fibre plants.

Nonetheless, it is recognized that if harvesting is beyond the plants' capacity for renewal, the resource will be degraded and the benefits derived by the users will be lost. Therefore, the best Management Practices for harvesting should be followed. Despite the multiple benefits that accrue from wetlands craft plants, the research conducted on these plants has been "patchy" and generally site specific. Research and conservation projects all too often move from one so-called "pilot project" to another without adequate attention devoted to developing an integrated overview of the situation. Although the Water Research Commission has recently initiated a major research project on the wetlands, this is focussed on the rehabilitation of wetlands. Thus, a key gap exists in terms of wise use of wetlands, particularly in relation to the utilization of wetlands plants.

Disparate sources reveal that KwaZulu-Natal has noticeably more projects and documentation related to wetlands craft species than other provinces, which is likely due to the particularly rich and widely prevalent tradition of woven crafts made from wetlands plants in the province. For this reason, Mandlanzini has been selected for a case study, in the hope that the knowledge related to wetlands plant utilisation and management, the lessons learnt from the various wetlands plant projects and the experience of harvesters, crafters, land managers and academics can inform utilisation and management practices for wetlands plants at a national level in South Africa.

4.5.2 Sleeping mats

Sleeping mats have cultural significance to most Zulu communities and Mandlanzini benefits from this particular tradition. Almost 70% of the respondents, the majority of which were women working around the Mandlanzini wetland area, produce craft sleeping mats from wetlands plants that they harvest. Rural women spend most of their time harvesting wetlands

sedges and weaving traditional sleeping mats from this harvested material. The women interviewed stated that different sedges harvested from the area are used for weaving, including *incem*a (*Juncus kraussii*) and *induli* (*Sciypas spp*), which are all harvested on the banks of the Mzingazi river wetlands. *Ikhwani* (*Cyperus latifolius)* is also harvested in the wetlands within the area. The *imizi* (*Cyperus textilius)* is widely used to make traditional sleeping mats. These mats have traditionally been used in ceremonies such as *imishado* (wedding ceremonies), *ukucimela* (the gifts a girl gets from the family before marriage) and they are also used for domestic purposes. Non-formal education plays a major role, particularly when the old people (particularly women) transfer knowledge about the fashioning of such mats to the growing and coming generation. In this study, most respondents confirmed that it was their grandparents that taught them, through non-formal education, how to make sleeping mats so that when the old ones no longer exist in this world, the current generation will be able to continue weaving sleeping mats.

Plate 4.1: Ikhwani harvested at Emandlanzini wetlands, KwaZulu-Natal, South Africa.

4.5.3 Beer strainers

In the wetlands of Mandlanzini, you may find women busy harvesting the sedge (*Cyperus margitus*) (see Plate 4.1). Once harvested, the stem of this

plant is rolled into a durable twine. One of the items traditionally woven from this twine looks much like a very large sock as it is designed to trap the grains of sorghum from the brew as it is poured into the serving container for beer. Women involved in this kind of crafting claimed that their parents tutored them in all kinds of arts. They said they did not attend any formal schools but that their knowledge was gained from their parents. The women said that their knowledge in utilising all of the wetlands resources came from their parents, who taught them while working the soil for *amadumbe.* They called the youngsters to collect sedge and showed them how to make beer strainers. The parent would usually make a strainer while the young woman made another. As part of the shared process of weaving the strainers, mistakes could be pointed out by the elders and corrected. This kind of education directed by the elders would continue until the young women succeeded in doing it correctly. Indigenous learning was learning from a master until you had mastered the skill yourself.

4.5.4 Thatching grass for houses

The harvesting season is from May to July. Fifty-one percent (51%) of the households at Mandlanzini were involved in the harvesting of grass for thatching. One harvester harvests approximately four bundles of grass within nine hours per day twice a week. It has also been reported that it takes less time to harvest a bundle of grass than river reeds. As the total number of hours required for harvesting a bundle of grass is known, it can be calculated that a household harvests about 90 bundles during a season. A bundle of grass measures about 850mm in diameter and weighs almost the same as a bundle of river reed. A bundle of grass was worth R 45.00 in 2006.

Plate 4.2: Thatching the roof of a circular hut using material from the wetlands

The harvesting of thatch grass has a two-fold significance for the households residing in this area. Firstly, they sell these bundles to their neighbouring communities who do not have access to the wetland resources. Secondly, most people construct round as well as four-cornered traditional houses to appease their ancestors. There is a belief that the ancestors visit homesteads and that they need to find houses familiar to them, i.e. traditional huts. The respondents also emphasised their belief that they could not communicate with their ancestors in houses roofed with corrugated iron or in any of the other types of modern houses. They could only do so in huts with thatched roofs.

4.5.5 Reed harvesting

The most common reed type found in the wetlands area is long and spiny and is used for roofing. At Mandlanzini, the wetlands reed is harvested throughout the year, particularly when the water levels have receded. Reeds are harvested using a sickle and then made into bundles. Information from the household survey and discussion groups revealed that, on average, an individual harvests two bundles in a five-hour workday. The average

frequency of harvesting varies from time to time, depending on the needs of the buyers. The estimated total number of bundles harvested annually is about 105. Bundles are carried on the head to the household yard where they are sold. A bundle of reeds was worth R30 at the time.

The bundles of reeds are placed underneath the grass of the roof as a foundation (Plate 4.2). According to the respondents, skilled men and women are employed to thatch houses. This kind of roofing was used particularly by Xhosa people, and was inherited by the Zulu people. It became a common method of building a house in KwaZulu-Natal. The respondents emphasised that this kind of roofing should continue from generation to generation because it has become part of their culture. They explained that they had learned the skills used in thatching from their parents. This proves that even indigenous culture is dynamic and sustainable so that people live in perfect harmony with their environment (unlike city dwellers) who will exploit and destroy. Members of the younger generation help their fathers and mothers during thatching and it is during this hands-on learning experience that skills are transferred from one generation to the next.

4.6 LIVESTOCK GRAZING IN THE WETLANDS

Most of the area of Mandlanzini is surrounded by the wetlands, which provide lush grazing for livestock. Since many people are subsistence farmers, their livestock tend to graze in the areas around the houses that are located in the wetlands area. Due to the limited availability of alternative grazing pastures, the communities are compelled to use the wetlands as grazing fields. Most of the wetlands users agreed that the wetlands couldn't accommodate too many livestock. They explained that about 100 square metres is required per 15 cows in order to avoid overgrazing and excessive

trampling that leads to gully erosion, which destroys the wetlands. Most women agreed that cows graze in the wetlands where they harvest *ikhwani* and *incema* and that this reduces resources used for crafting. It was also clear that grazing cattle tended to contaminate natural pools used for domestic purposes and for drinking water. Most of the elders said that their parents had taught them not to allow cows to graze in the areas where the women harvested the wetlands resources and also during the period of harvesting. Most of the old men said that, as herd boys, they were told not to allow the cattle to graze for too long time in one wetland area. They should allow resting periods for the wetlands to recover from damage caused by stock grazing. Only cows should be allowed on wetlands, and not goats, as goats tended to trample the wet soil and create muddy conditions.

4.7 COLLECTION OF WATER FROM THE WETLANDS SWAMPS

Water used for human consumption is collected from the springs that feed the wetlands and also in the wetlands itself. These points are usually protected from livestock or pollution with fences or bushes. It is the responsibility of the women to collect drinking water for their households (Plate 4.3). The water running from the wetlands is used for washing. The respondents seemed to understand the basic workings of the wetlands and they appreciated the fact that without water there is no life.

It is recognised that, across South Africa, there are many customs and traditional practices surrounding water collection. For example, if a spring or seep is for human use, a circle of stone with a small outlet often protects it and cattle are made to drink elsewhere. In this study, most respondents who practice livestock farming agreed to the validity of the customs and

traditional practices of water collection. They said that if a spring or seep was discovered in their areas, they often protected it by using timbers placed in a circle. When someone comes to fetch water, he\she can then stand on the timber without putting his or her feet in water meant for human use. Most of them said they that they followed all these practices for hygienic purposes, and to avoid diseases that might be carried by contaminated feet.

Plate 4.3: The collection of water in the wetlands at Mandlanzini

Water is usually fetched in 5 to 25 litre containers as more than that might limit the chance for others to get water. Respondents emphasised that their parents had always encouraged them to wash their containers at their home before they went to the river in order to avoid contamination that might occur if they washed their containers next to the water sources. This kind of indigenous practice in water collection encourages an approach in accessing water. Children from the age of seven, especially girls, receive this kind of non-formal education that helps to establish healthy practices. For example, the boys in the wetlands area under discussion were told to drive the cattle in their keeping to the places close to the Mzingazi River, where they could gain

access to springs that could easily recover from trampling as they were frequently washed by overflow from the river. By learning traditional practices in the process of non-formal education, future generations are helped to build respect for their cultural heritage and to enhance their understanding of water quality issues.

4.8 MEDICINAL PLANTS

Most of the communities around Mandlanzini depend on traditional healers to attend to certain ailments. Traditional healers use numerous medicinal plants harvested in the Mandlanzini area for various purposes. In essence, the in-depth interviews revealed that most traditional healers in the area sold medicinal plants to the local markets in Richards Bay for profit. The harvesting of these plants, according to many respondents, however, is not regulated. Interestingly, the people who harvest these medicinal plants in bulk are not traditional healers but medicinal plant sellers who harvest these plants for commercial purposes. Kabudi (2004) laments the fact that while the west values IK, institutions in Africa still regard IK as irrelevant and inconsequential. One of the elders in the community captured his understanding of community ownership of the wetlands as follows:-

> *"We as traditional healers harvest medicinal plants as much as we like. It makes a lot of sense since this area belongs to all the people of this community."*

It is true that these medicinal plants face challenges since many activities, such as livestock farming and the cultivation of other crops causes depletion in the stock of traditional medicine plants. One of the healing plants, namely *iphuzolomlambo* (also known as the river pumpkin or *Genera (Perp*en), is

used to promote fertility in both humans and livestock. It is also believed to ease the process of child birth. Other traditional healers say that they mix river pumpkin with other plants to treat kidney and bladder complaints. Most elders who collect medicinal plants said that parts of the wetlands, which tended to have a lot of medicinal plants, have been fenced like farmland and livestock farmers were advised not to allow their cattle to graze on it. The value of indigenous knowledge of herbs to pharmaceuticals cannot be disputed. It is public knowledge that South African plant material is exported to other countries and that laboratories there extract medicinal ingredients from them in order to manufacture medications for various ailments and diseases.

The people occupying the wetlands were forbidden to plant crops such as *amadumbe* and other vegetables in such areas that had apparently been designated as places for growing healing resources. Most respondents, particularly the older people, stated that non-formal education was introduced to children from the age of 7. The children were not allowed to walk in such areas because they could trample the plants used for healing. Young men were also not allowed to drive herds of cattle over such areas as they would trample the plants, thereby destroying valuable healing resources that people depended on.

4.9 ATTITUDE OF THE COMMUNITY TOWARDS WETLANDS RESOURCES

The community of Mandlanzini depends on the wetlands for their livelihood and the respondents in this study, both young and old, voiced the opinion that they would welcome assistance of any kind and from any organization that may lead to an improvement of their agricultural practices. When the case

study was conducted most of the elders in the community were not satisfied that conducting the study was about research and that the information would be stored at a university library; they thought that the information would be used by government officials to stop them using the wetlands which they have been using for a long time. Some refused to respond, saying that there was no such thing that the wetlands would be degraded, because they were God's creation. God is said to have created the earth and to have appointed humankind as stewards of all the things created. Most of the youth among the respondents stated that such a case study would help them to access information about the use of the wetlands and give them ways to restore wetlands. Most elders stated that in ancient times peoples' attitudes towards wetland resources were to restore them and to keep them functioning adequately. Nowadays, willingness to value the wetlands is very poor because of the modern ways that people have adopted of accumulating wealth and not using the natural resources for survival.

4.10 INVOLVEMENT OF TRADITIONAL HEALERS

Local traditional leaders in the Mandlanzini area fall under the uMhlathuze Municipality council. In this study, it was found that traditional leaders were not involved in the education of people or in guiding them on how to use the wetlands in a sustainable way. In interviews with some of the traditional leaders, they said that although they were aware of people using wetlands and the importance of these to society, their committee has not discussed wetlands usage. They have had no discussions on how to restore them and there were no rules and regulations towards the restoration of wetlands and against the allocation of land next to the wetlands to people. Some councillors said that this is due to lack of knowledge about wetlands and that

it should be brought to the attention of the government and of non-governmental organisations (NGOs).

This research study includes a survey on how certain areas in the wetlands have been allocated wrongly as residential sites. When traditional leaders were asked about this situation they said that this was due to a lack of knowledge on the part of certain traditional leaders. Traditional leaders were also faced by the problem that some of community members believed that the wetlands belonged to them and that no one could prevent them from using wetlands, as created by God. This belief provided challenges to other traditional leaders in advising people about wetlands affairs. Non-formal education would be required to train traditional leaders as most of them have very little formal education.

4.11 INDIGENOUS KNOWLEDGE AS PRACTICED IN THE WETLANDS

Discussions with subsistence farmers on wetlands issues focused on the origins of wetlands use, and how farmers gained the knowledge and skills necessary for actively managing their wetlands. Although it was expected that the community leaders and wetlands users would cite ancestral knowledge as a dominant source of wetlands information, most people stressed the importance of innovation in the draining and cultivation of wetlands. Most of the knowledge identified during a one-on-one session came from parents. One of the interviewees, a parent raising children on the wetlands, explained:

> *Many of us use knowledge that comes from our fathers and grandfathers: especially about how to drain the wetlands effectively*.

Most respondents said that they received little technical support from the Department of Environmental Affairs and Tourism or from the Department of Agriculture on how to cultivate the wetlands in the first instance. During the first Phase, one community developer was said to have encouraged farmers to cultivate their wetlands but at the same time failed to offer any credible advice on how to drain and clear vegetation. As such, community members revealed that they were the ones who had initiated wetland cultivation techniques.

Although wetland users may have had some advantage in terms of ancestral knowledge, they acknowledged that wetlands management has been a process of trial and error. In essence, numerous innovations, individual experimentation, adaptation, farmer-to-farmer communication and direct observation appear to have contributed to this trial and error process of wetlands knowledge acquisition. Since some of these respondents knew nothing at first, initial information on how to cultivate the wetlands appears to have been acquired from their senior counterparts:

> *"It is very true that cultivation and drainage techniques are a complicated process, but most of the information we have was borrowed from senior wetlands users. The senior members told us that if you dig a ditch down the middle of the wetlands and drain the water from the wetlands you can plough the land and cultivate maize, amadumbe, cabbage and onions as well" (Phase 1/07).*

The direct observation of farming practices and wetlands strategies appears to play an important role in the development of farmers' wetlands' knowledge, particularly during the first Phase. Several wetlands' users and subsistence

farmers described how observations of other farmers' wetlands plots have resulted in a transfer of techniques.

> "*As a farmer, I heard people talking about crop rotation. Since this was not a familiar concept, my son-in-law who has experience on wetlands utilisation, told me that I can plant potatoes and amadumbe interchangeably. I asked him when to sow and harvest and then tried it here. I did this about three years ago and everyone copied me. I have been to Nseleni and I've seen farmers there cultivating wetlands by hand. They are doing it properly. Every wetland is different though. Even though the communication among wetlands users elsewhere is evident, however, it appears that wetlands knowledge has been acquired largely through innovative practices. It is clear as well that people here are making significant modifications to their wetlands farming system in response to changes in the wetlands environment, particularly weather conditions and the introduction of new crops. This clearly indicates that wetlands knowledge is evolving over time. We've learned how to block ditches when it gets dry and when the soil is wet we unblock. We have learned this and no one has taught us how to do that. We have also learned to dig second and third drains depending on the soil moisture conditions.*"

In some of the responses, the recognition of dry and wet spells seems to have triggered desperate measures on when and how to drain a wetland for successful planting. Since some crops constantly require large amounts of water for survival, this has raised awareness among many wetlands users to closely monitor the availability of water. One woman who was interviewed stated this transition clearly:

> "*I used to grow only amadumbe but now I also grow vegetables for my family. There is also a difference in the time of planting. It was previously December to May but now it's February to June or July. This is due to changes in rainfall pattern*."

In concluding this chapter, the researcher recognises that indigenous knowledge has a role to play in society and that it should be integrated as a part of development issues. Monyatsi and Nleya (2004) in describing the nature of Indigenous Education (IE) in Botswana state that the aims of Indigenous Education are to preserve the cultural heritage of the extended family, clan and tribe. Further, IE helps members of the new generation to adapt to their physical environment and to teach them how to control and use it in a sustainable manner.

4.12 CONCLUSION

This chapter presented a critical analysis of wetlands utilisation generally in South Africa, more importantly the series of debates, which arose during the in-depth interviews. The first section discussed the demographic structure of the community under study and its influence towards wetland utilisation. The findings about the level of education implied that the general lack of education leads to serious misuse of wetlands biodiversity. Second it appeared that wetlands play a central role in ensuring that health of natural environment is sustained for future generation. Third local community are crafters as a result people use wetland resources to make craft for sales and to earn incomer. Many farmers in this community use wetlands to graze their livestock, collect water and get medicinal plants from wetland resources.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter provides a summary of the study as well as main conclusions drawn from the results. The descriptive analysis and the socio-economic results reported in this study show that the observed patterns in the data collected are determined by average household size. This means that the greater the number of people in one family, the greater the demand of income to feed and maintain daily activities. The results also show that the poor households in Phase Six rely on wetlands resources to meet household needs. The dependency on wetlands resources is shown to be strongly influenced by several socio-economic factors, such as education profile, employment characteristics, household size and cultural factors.

The results further show that people in Phase One have negative attitudes towards wetlands resources utilisation. They said that wetlands products, such as *amadumbe,* were difficult to cultivate (labour intensive), time consuming and that it required transport. These people prefer to work for local industries that pay them decent salaries that allow them a better life. The arguments and observation developed around the use of wetlands resources in this research project revealed that wetlands restoration programmes face many challenges, especially with regard to the impact that it may have on impoverished households in Phase six that rely on the wetlands for their livelihood. A number of considerations should be taken into account in devising restoration programmes for the wetlands, among

them, the need to cater for the requirements of poor households that rely on wetlands resources. This is where wise usage of resources enters the picture.

The following aspects are dealt with as identified below:

(i) Identification of the socio-economic status of people living: in Phase 6

(ii) The range of wetlands resources that people use: in Phase 6

(iii) The attitude of people towards other natural resources: in Phase 1

5.2 THE PRESENT SOCIO-ECONOMIC STATUS OF PEOPLE LIVING IN PHASE SIX

Generally, in this study, it is evident that, as income rises most households begin to move away from utilising wetlands resources for survival towards a more modern lifestyle. In Phase One, for instance, the results reveal that about 70% of poor households use resources other than those produced mainly on the wetlands because they can afford them. Therefore, this finding confirms that as people become affluent, they tend to look for more sophisticated livelihood resources. In contrast, low-income households in Phase Six highly rely on wetlands resources for both subsistence agriculture and livelihood. In general, people with low incomes have a poor educational background; therefore, there is a need for development of public awareness and understanding of issues around wise use and protection of wetlands so that they, the people, can be enabled to support sustainable development.

Crafters have developed a strong tradition in the making of various community craftworks, such as mats for sleeping on, which are also used in traditional practices such as *umabo* (gift giving**).** The practice of making crafts from wetlands resources is illustrated in Plate 1. Particularly in Phase

Six, the local occupants of the study site are mainly Zulu communities who use *incema* (Juncus krausii) and *induli* (Sciypa spp) to make mats that serve as beds. The high poverty level means that they cannot afford beds. In Phase One people use sleep mats to decorate their house walls to display traditional culture and to be kept as gifts for girls about to marry. The beer strainers are part of both phases among community members since they use it in straining sorghum beer, thereby also maintaining their cultural customs.

The survey results furthermore show that household size is one of the significant factors that affect the use of wetlands resources. In this context, household size refers to the number of people found in the household. Phase 6 households are larger than the households found in the high-income community of Phase 1. The study found that households in Phase 1 utilize more wetlands resources to meet their demand for food, which is larger than that of the households in Phase1. The study also illustrates clear examples of poor people who rely totally on natural resources for their livelihood and the ways they engage in that maintains sustainable development of natural environment.

5.3 THE RANGE OF THE WETLANDS RESOURCES USED BY PEOPLE IN PHASE SIX

Wetlands resources have played a key role in the widespread increase of more accessible and affordable resources for the people in Phase Six. It is evident that these changes are restricted to a particular end uses i.e. market, favour, and culture. Most of the households in Phase Six at Mandlazini use various wetlands products as food, such as *amadumbe*, bananas and paw-paws. However, the preferred crop is *amadumbe*, because it is the staple food.

The wetlands resources and products are harvested seasonally. The majority of wetlands resources, other than foodstuffs are the *incema, ikhwani* and *imizi* that are used to make sleeping mats and beer strainers. as illustrated in this study. Other than planting *amadumbe* or harvesting *ikhwani,* people from Phase Six use the wetlands as a source for water used for various purposes. In interviews with the inhabitants, it became evident that the local communities rely on various resources offered by the wetlands during a particular season, while utilising other resources in the mean time. It was also seen as accepted practice to allow the parts of the land to rest, thereby working with nature in order to help conserve the wetlands. Water is collected from springs around the wetlands and communities should protect it from being polluted by means of fencing. This forms part of indigenous knowledge that is used to conserve wetlands resources. Water in the wetlands is collected in 5 to 25 litre containers, as indicated in Plate 3. The Mandlanzini people, particularly in Phase Six, put indigenous knowledge to work. Allowing grazing of livestock on the wetlands, however, shows a lack of insight into the long-term effects on the wetlands and is one of the activities practiced by the local people of Mandlanzini that does not benefit restoration measures. It is evident that, as people obtain increasing numbers of livestock, sustainable use of the wetlands is placed in jeopardy.

5.4 ATTITUDE OF PEOPLE TOWARDS OTHER NATURAL RESOURCES

The results indicate that Phase One people rely on resources other than what the wetlands have to offer. People at this phase do not depend solely on wetlands resources but tend to rely more on timber, so they spend money on planting gum trees, which generate a reasonable income through timber sales.

Mandlazini households in Phase One tend to employ people from Phase Six, who are poor and need money urgently, to realise their goals.

5.5 INDIGENOUS KNOWLEDGE UTILISATION ON WETLANDS

The subsistence farmers outlined the importance of wetlands utilisation with the aim of gaining more knowledge and skills. Wetlands users must revisit their ancestral knowledge, which encourages innovation that is practiced in wetlands drainage and cultivation techniques. It was evident that most knowledge used for effective wetlands drainage was passed on from the forefathers. The results furthermore show that little or no technical assistance with regard to innovation in cultivating the wetlands effectively is forthcoming from the relevant stakeholders. Although, some developers have shown interest in wetlands cultivation, they have failed to offer credible advice on how to drain ditches and clear undesired vegetation. Wetlands users at Mandlanzini acknowledged methods for wetlands cultivation based on trial and error informed by communication between farmers as well as by direct observation.

5.6 RECOMMENDATIONS

It is recommended that users of wetlands that rely on its resources for a livelihood should be assisted by clear government policy that provides guidelines on the extent to which they can make use of these resources and that suggest suitable crops that they can plant so that the wetlands can be used in a sustainable manner. The study revealed that most people are forced to rely on the wetlands to earn a living and to maintain their socio-economic status. An increase in income allows the people to shift their focus from the wetlands to other resources. This means that an increased means of income generation can contribute to wetlands rehabilitation or restoration since it

decreases the demand for wetlands resource usage. Increased government grants will also contribute to the conservation of the wetlands because this will enable people to buy food from shops rather than depending entirely upon wetlands resources.

The study also highlights the fact that an increased level of education allows reduced usage of the wetlands as a source of income. People who have tertiary education do not have to rely on the wetlands for an income because they have adequate monetary resources to cater for their families. It is the poorest households that mostly rely on the wetlands since there is no other source to sustain their livelihoods. Indigenous knowledge is practised to control the use of wetlands, but subsistence farmers would welcome new methods of using the wetlands in a sustainable way. There is need for extension officers to assist subsistence farmers to use the wetlands more productively without damaging it.

In order to maintain strong sustainability in wetlands usage, community households should invest in their young generation, who will be better equipped to utilise these resources. The study has shown that older people are the ones who are more involved in wetlands usage; only few youth take part in such activities. Some of the young people realise that they may need knowledge about wetlands usage in the future and admit to learning skills from their elders who try to instil an appreciation of the wetlands in them.

The cultivation of wetlands has a long history that shows that especially those with low incomes (or no income at all) are involved. People depend on the wetlands in various ways. In this study, households revealed that they ploughed in order to plant *amadumbe*, bananas and other foodstuffs to feed their families. These resources have provided a livelihood to many people,

even to those from outside the country. Some foreigners who generally come from poverty-stricken countries find work in planting and harvesting various crops for members of the local communities who pay them a pittance for their hard work. Some manage to obtain land and plant crops of their own for consumption and marketing. Different ethnic groups share their ideas regarding the utilisation and restoration of the wetlands for future use.

Some people, such as traditional healers, benefit by obtaining medicinal plants for healing people from the wetlands. Most people harvesting medicinal plants come from outside the area, although people within the area also use medicinal plants. They harvest various plants, using the roots and leaves to obtain curatives. The study reveals that the medicinal plants are not necessarily replaced once harvested. People tend to assume that nature will take its course and replace the harvested plants. This amounts to unsustainable practice in harvesting, which causes great loss and may drive certain species to extinction. The attitude of the community towards wetlands resources shows that most people act positively in bringing sustainability to the wetlands so that the future generation will benefit, as they had done. A major problem revealed by the study is that the community pays little attention to modern approaches that could minimize damage to the wetlands, and hence, benefit sustainable usage. Practices based on indigenous knowledge may be working to some extent, but there is a great need to integrate indigenous knowledge with modern technology to assist increased production of food.

5.7 CONCLUSION

In conclusion, the study highlighted the importance of wetlands to poverty stricken people living in rural areas. There is no doubt that their livelihood is enhanced by the use of the resources found in and around wetlands. The

much talked about shortage of water in South Africa means that issues of taking care of wetlands have to be emphasized and pursued by government to make sure all citizens act responsibly toward wetlands. The general understanding of sustainable development is that we all protect and wisely use our resources such that they benefit not only the present generation but future generations as well. When we talk about sustainable development, we mean that people should learn how to make decisions that consider the long term future of the economy, ecology and the well being of all communities. The key task of education is to build among learners the capacity for such future oriented thinking**.**

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APPENDIX - A

QUESTIONNAIRE

ON

NON-FORMAL EDUCATION AND WETLANDS RESTORATION

Surname and name: ……..

Location ……..

Phase ……...

Age ……...

Gender ……...

No. of members

In a family ……...

1. Do you have any understanding about the importance of natural resource within this area?

YES	NO

	Recourses	**Importance**
1.		
2.		
3.		
4.		

2. Are there any agricultural activities community practiced in the area?

YES	NO

1.

2.

3.

4.

3. What are the common crops planted by people in this area?

YES	NO

1.

2.

3.

4.

4. What methods are commonly used for planting such crops?

	Crop	**Method/s**
1.		
2.		
3.		
4.		

5. Are people in this area aware of the presence of wetlands?

If yes, explain……

……..

YES	NO

6. Have you ever received any formal education about wetlands?

YES	NO

If yes, explain……..

……

7. Have you ever received any informal education about wetlands?

YES	NO

If yes, explain……

8. Have you ever received non-formal education about wetlands?

If yes, explain……

YES	NO

……..

9. Have you tried to implement any kind of education method to secure wetlands?

YES	NO

If yes, explain……

……..

10. Are there any other ideas/ strategies you can think of that could be used to secure wetlands?

YES	NO

If yes, explain……..

……

APPENDIX - B

UTILISATION OF REOURCES AND ACTIVITIES

1. Explain briefly what important cultural activities being practiced in this wetlands.

……

…….....

.....

2. Resources

2.1 What type(s) of resources available for craft and woven construction?

- Sedge [ ]
- Reeds [ ]
- Others [ ]

3. Which resources among the mostly important to you?

- Sedge [ ]
- Reed [ ]
- Water [ ]
- aMadumbe [ ]
- Banana [ ]
- Others [ ]

4. Why this particular resource is important to you wellbeing?

- Sedge [ ]
- Reeds [ ]
- Water [ ]
- Medicinal plants [ ]
- Amadumbe [ ]

- Banana [ ]
- Others [ ]

5. What attitude do this community have towards these resources?

   Positive [ ]

   Negative [ ]

6. Do you know any mechanism to protect these resources from abuse?

……

……

……

7. Activities

7.1 Do you know activities that are commonly practiced here?

Yes [ ]

No [ ]

7.2 If yes, name different activities being practiced by people in this wetlands.

……..

……..

7.3 How much does it cost to plant amadumbe, banana?

…….

7.4 What machinery/equipments are for planning amadumbe, banana in the wetlands?

- Hand hoe, spade. [ ]
- animal disc [ ]
- tractor disc [ ]

7.5 How many people rough work in each plot of land in the wetlands?

- One [ ]
- two [ ]
- three [ ]
- four [ ]
- five [ ]

7.6 If more than two, then; who pays their salary at the end of the month?

- Owner [ ]
- family [ ]
- my children [ ]
- none [ ]

8. Socio-economic status

8.1 Who is a breadwinner in this home?

- Mother [ ]
- Father [ ]
- Children [ ]
- Grandparent [ ]
- Both mother and father [ ]
- Extended family [ ]
- No one [ ]

8.2 How do you get income for supporting this family?

- Employed [ ]
- Self employed [ ]
- Pension/children grants [ ]
- Family members [ ]
- None [ ]

8.3 What is the highest level of education?

- Grade 1 to grade 7 [ ]
- Grade 8 to grade 12 [ ]
- Tertiary [ ]
- None of the above [ ]

8.4 Can you rough give the estimated of your household income per month?

- R200-450 [ ]
- R500-R850 [ ]
- R900-R1250.00 [ ]
- R1300-2450.00 [ ]
- R2500-5000 [ ]
- R5000-10000 [ ]

8.5 How many people household member stay here?

- 1 to 2 [ ]
- 3 to 4 [ ]
- 4 to 5 [ ]
- 5 to 6 [ ]
- 7 to 10 [ ]
- 11 and above [ ]

9. Do you have any General Comments:

_____

_____

_____

_____

_____

_____