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The role of permaculture in promoting sustainable livelihoods and ecological conservation: a study of ISimangaliso Wetland Park in Umhlabuyalingana, KwaZulu-Natal

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UNIVERSITY OF THE
WITWATERSRAND,
JOHANNESBURG

Masters Research Thesis

Faculty of Science

School of Geography, Archaeology and Environmental Studies

The Role of Permaculture in Promoting Sustainable Livelihoods and Ecological Conservation: A Study of ISimangaliso Wetland Park in Umhlabuyalingana, KwaZulu-Natal.

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Dedication

This dissertation is dedicated to my grandmother who despite not having a formal education, saw the value of education and encouraged me to study further. Thank you Manyawuza, may the good Lord bless you. And to my late mother who worked so hard to raise and nurture me, but never got an opportunity to celebrate my special graduation days with me. Thank you, mom, for all that you have done for me and I promise to continue making you proud. Lastly, to my son who sacrifices so much to stay without me while I pursue my studies. Thank you, my baby, for being so patient and being able to see the bigger picture at such a tender age you are a real man, God bless you, my son.

Acknowledgment

I want to extend my sincere gratitude to the following people and institutions that made it possible for me to complete my studies:

Firstly, I would like to extend words of appreciation to Professor Mulala D. Simatele, my supervisor for believing in my capabilities. His guidance and encouragement motivated me to work extra hard to complete my studies. Thank you for being patient and pushing me to do better every day.

I would like to extend my gratitude to my family and my friends for their unshaken support and being my greatest pillar of strength. To my grandmother, Chumisa, Zona, and my son Iminathi, thank you for being by my side through thick and thin.

To Ms. Denise Mombeg and Fancy Stitch members, thank you for opening your hearts for me. The love and support I got from you and your team were beyond my expectations. Keep on doing the good work and God will continue to bless you abundantly.

I would like to extend my sincere gratitude to the Department of Agriculture, Forestry, and Fisheries for giving me the opportunity to study further by funding my studies and giving me a living allowance to take care of my needs while I continue with my studies. May you continue to assist other children coming from disadvantaged homes.

Declaration

I **Anela Fixi**, declare that the role of permaculture in promoting sustainable livelihood and ecological conservation: A study of iSimangaliso Wetland Park in Umhlabuyalingana, KwaZulu Natal present my work, and all the material I used and quoted in this study have been acknowledged and indicated in the form of reference page and this study was not conducted and submitted by me at any other institution before for the purpose of obtaining a degree.

Signature .....

Date 20 May 2020

Abstract

This study investigated how permaculture as an agricultural activity can be used or can promote food security while ensuring environmental and ecological conservation and restoration of wetlands using iSimangaliso Wetland Park as a case study. It has been argued that agriculture, which is one of the activities taking place at iSimangaliso Wetland Park wetlands causes wetland disintegration, eutrophication, contamination, ecological deterioration and totally dry out of the ecosystem. Permaculture is a system that is designed to be a solution to such problems as it works with nature in a way that sustainable agricultural systems and human habitats imitate the relationships and patterns found in natural ecologies.

Using a qualitative research approach, this study engaged with various respondents and considered theories and case studies to get a better understanding of permaculture and its principles in relation to food security and wetland conservation. A series of interviews, open-ended questionnaires, and field observations were used to collect data.

Research findings suggest that permaculture is an agricultural approach that can align agricultural productivity and wetland conservation in a way that the two can have a harmonious relationship. The findings show that the methods of permaculture used in this study reduces the pressure of natural resource consumption and allows iSimangaliso Wetland Park wetlands to restore itself and at the same time, it ensures that the needs of Umhlabuyalina people are taken care of. This is because permaculture principles care for people, care for the environment and care for the distribution of resource surplus in order to sustain livelihoods.

Keywords: Permaculture, Agriculture, wetlands, food security, iSimangaliso Wetland Park.

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CHAPTER ONE

1.1 Background of the study

Wetlands have supported agriculture for many years; providing fertile soils, and constantly supplying water to support agricultural production (World Wetland Day, 2014). Wetlands are a habitat for biodiversity, including pollinators of crops that provide frost protection and are also predators of crop pests (Gerakis and Kalburtji, 1998). Wetlands act as a key resource for pastoralists and cultivators in Savanna Africa during drought or dry season, by providing grazing and arable land for agriculture (Scoones, 1991).

Agriculture in developing countries is the main driver of economic growth and sustains most poor rural households through the provisions of different livelihoods and income generation activities. It is argued that an estimated 2.5 billion rural households rely on agriculture, hunting, fishing and forestry for their livelihoods (World Wetland Day, 2014). H owever, the increase in population combined with the changes in climatic conditions and water scarcity is forcing many of the rural population to expand their agricultural activities into the wetlands to ensure increased agricultural productivity and food security (Rebelo, 2009). This development has put huge pressure on the well-being of wetlands thereby, compromising their functions in supporting biodiversity and associated functions.

Furthermore, existing studies show that the commodification of wetlands for commercial purposes resulted in the destruction of wetlands triggering a decrease in biodiversity (Gerakis and Kalburtji, 1998). In view of these arguments, the study by Gerakis and Kalburtji (1998) is of the view that wetlands provide resources that can potentially contribute to the development of sustainable agriculture and food security in countries that are facing increased environmental change.

One agriculture activity which has been argued to be ecologically and environmentally friendly is permaculture because of the farming strategies and practices which it employs. According to MacManus (2010) permaculture is an agricultural approach that is broad-based as it cares not only for the well-being of communities and their needs but also for the well-being of the environment and the ecosystem. Holmgren (2012) defines permaculture as a conscious design of landscapes which mimic the patterns and relationships found in nature while yielding an abundance of food, fiber, and energy for provision of local needs. Thus, permaculture as a way of farming adopts sustainability principles that ensure the needs of the present generation are met without compromising those of future generations.

1.2 Problem statement

Wetlands serve as an important natural infrastructure for agricultural production through the supply of arable soils and reliable water required for farming. They are a key component of achieving the goal of poverty reduction worldwide by providing necessary nutrients for agriculture productivity which contributes to people's livelihood and nutritional requirements (World Wetland Day, 2014). Despite this functionality, wetlands are becoming more at risk due to the growing demand for land and water for agricultural production. They are also threatened by population growth, climate change, and extensive development initiatives aiming at poverty mitigation. Wetlands used for agricultural production can be poorly managed and have negative impacts on the wetland ecosystem. This leads to changes in water quality, quantity and conversion and drainage of wetlands to cultivated lands, thus, leading to ecological disturbance, or permanent loss of wetland benefits (World Wetland Day, 2014).

iSimangaliso Wetland Park is the country's largest natural freshwater wetland situated on the coastal plain of north-eastern KwaZulu-Natal in South Africa (UNEP, 2006). iSimangaliso Wetland Park is home to diverse species of plants and animals and provides a variety of habitats for birds, mammals, and aquatic life, e.g. large

crocodiles, hippopotamus population and rare climbing orchid population. The rural communities around this wetland are totally dependent on iSimangaliso Wetland Park for fauna and flora (UNEP, 2006).

According to Bulat and Yilmaz (2008), cultivation and deforestation in the wetland catchment areas have been noted to exacerbate erosion, pollution, dry up of wetlands and eutrophication in most of the drainage lines feeding the iSimangaliso Wetland Park wetland. The large areas of forests are cut down and burnt, as poor local communities see logging as a means of meeting their needs (UNEP, 2006). This clearly shows that communities need to be educated on the sustainable use of natural resources.

MacManus, 2010 and Mukute, 2009 however, claim that permaculture is the form of agriculture system that can be employed to integrate wetland conservation and agriculture development in a way that the two complement each other and have a harmonious relationship. According to MacManus (2010) permaculture is an approach that looks at the whole system; it focuses on the interaction of every component in that system, as well as learning from past mistakes to make a plan of how to fix the system in the long term sustainable way while acknowledging the patterns of the natural ecological systems. In view of this, the current study investigated how permaculture and the methods that are used in this agricultural system can be used as a strategy to promote sustainable agriculture as well as household food security, while at the same time, promote ecological conservation of wetlands. This study was specifically interested in how permaculture methods can be used at iSimangaliso Wetland Park which is located in Umhlabuyalingana Northeast of KwaZulu-Natal.

1.3 Gaps in this study

From the reviewed literature, it is obvious that a lot of work has been done on the potential of permaculture as a food source. For example, permaculture is found to be an agricultural approach that cares for people, cares for the environment and cares for the distribution of resource surplus. MacManus (2010) states that

permaculture is an approach that looks at the whole system; it focuses on the interaction of every component in that system; as well as learning from past mistakes to make a plan of how to fix the system in the long term sustainable way while acknowledging the patterns of the natural ecological systems. When we look at all the work that has been presented in this study it is evident that permaculture is an eco-friendly practice and system. However, from the work that has been reviewed so far, it appears that most of the work has been done in developed countries. There is little work that has been done in developing countries such as South Africa. For example, there is not much knowledge and work done to examine how permaculture methods can be used to promote food security in overpopulated countries with limited resources. Wetland users and local leaders are not well educated about the sustainable use and management of wetland resources. Consequently, an unbiased understanding of how farming in wetlands, in general, might contribute towards conserving and maintaining biodiversity is absent.

1.4 Research aims and objectives

The aim of this study was to investigate how methods of permaculture can be used as tools that promote sustainable livelihoods and wetland conservation in iSimangaliso Wetland Park in Umhlabuyalingana, KwaZulu-Natal.

In view of the above aim, the objectives of the study were:

I. To investigate how the role of permaculture as a practice and its methods can contribute to promoting sustainable agriculture and food security in Umhlabuyalingana.
II. To identify ways in which permaculture aligns agriculture productivity with wetland conservation in iSimangaliso Wetland Park.
III. To investigate ways in which permaculture promotes wetland conservation in iSimangaliso Wetland Park.

1.5 Theoretical Consideration

This section provides a brief review of the literature and theoretical debates captured in chapter 2 of this dissertation. It starts by engaging with literature that examines permaculture as a sustainable agricultural approach that alleviates poverty. It further presents literature on how permaculture practices can be used to promote sustainable livelihoods and how permaculture tools can be used to integrate agricultural productivity and wetland conservation. Lastly, clarification on various concepts mentioned in this study will be provided in chapter 2.

Permaculture was developed in the 1970s by ecologists Bill Mollison and David Holmgren in Australia, in response to agricultural pollution, industrial pollution, land degradation, and biodiversity loss (Mukute, 2009). This farming method was introduced to Southern Africa in the late 1980s (Mukute, 2009). MacManus (2010) defines permaculture as a system that is designed to work with nature in a way that sustainable agricultural systems and human habitats imitate the relationships and patterns found in natural ecologies. MacManus (2010) points out that permaculture achieves this by reducing society's reliance on industrial systems of production and educating people about systems that are deteriorating the earth's ecosystem.

The study by Bulut and Yilmaz (2008) is of the view that permaculture is a system that integrates ecology and human life; organic growth and landscape by focusing on sustainability and productivity. This is because permaculture is designed based on ethical rules that are related to land use, food production, and social needs. Permaculture principles encourage people to create their own environment and construct self-sustaining human settlements. This aid to solve problems internally by redesigning the harmful systems to become naturally regenerative (MacManus, 2010).

According to Holmgren (2011), permaculture has 12 design principles that encourage the conservation of the natural environment and promote an

adequate supply of nutrition to people. These principles are "observe and interact; catch and store energy; obtain a yield; apply self-regulation and accept feedback; use and value renewable resources and services; produce no waste; design from patterns to details; integrate rather than segregate, use edges and value the marginal; creatively use and respond to change".

Bulut and Yilmaz (2008) stated the fields that have taken into consideration the permaculture principles all over the world. These fields include urban agriculture, agroecology, environmental design, ethnobotany, aquaponics (symbiosis of fish and plants), agroforestry, appropriate, technology (for green technology), deep ecology, ecological footprint, bioclimatic, ecovillage, forest gardening, holism, home gardens, green syndicalism, organic farming, renewable energy and Petro-free, sustainable agriculture, sustainable habitat systems, ecology, the natural step and etc.

Mukute (2009) examined the concept of permaculture in the context of Africa. He stated that permaculture was introduced in Southern Africa in the 1980s, and it was noted in other developing countries like Zimbabwe in the mid-1990s. According to MacManus (2010), permaculture was introduced to Africa in response to different challenges humans face in their natural environment. These challenges include the need to adapt to a changing and unfriendly environment; sustainability and water deficiencies; the quick consumption of non-renewable resources and the destruction of the ecosystem that keep up the balance in the environment.

Permaculture strategies are found to be suitable for addressing challenges that humans face in their environment. This is because permaculture is an agricultural approach that is sustainable and self-sufficient. It provides basic needs like water, food, shelter, and working environment, to common individuals in the communities. Permaculture cares for people, cares for the environment and the distribution of resource surplus to meet people's needs. Permaculture also adopts a sustainability perspective encouraging humans to be prepared to give back

what they have taken from nature to preserve it for future generations (Holmgren, 2012).

The agriculture sustainability diagram below shows a three-pillar of sustainability that assures that the needs of the present are met without compromising the ability of the future generation to meet their needs. These pillars are designed in a balanced manner so that one does not destroy the other. These pillars are made up of economic, environmental and social pillars. According to Fehér and Beke (2013), Environmental pillar deals with the impacts of agricultural activities and preservation of biodiversity; the economic pillar deals with the impacts of competition indication on profitability and competitiveness; and the social pillar deals with the preservation of cultural values, the role of the local institutions and the continuing existence of rural communities.

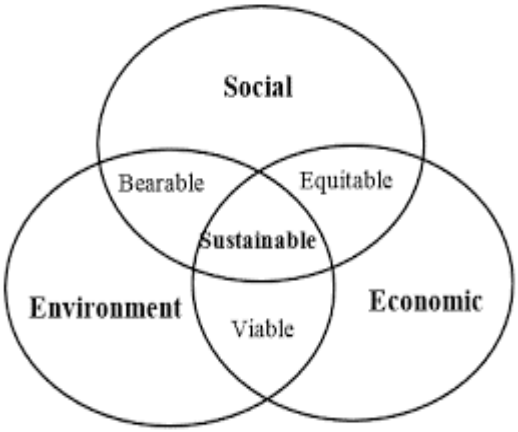

Figure 1: Diagram showing the three-pillar approach of agriculture Sustainability (source: Fehér and Beke, 2013)

1.6 Preliminary Methodological consideration

This section introduces the techniques that were adopted for this study as well as essential methods to be applied throughout the examination. This section also introduces the research positionality, study population and sample procedure,

data collection tools and data analysis and displays the scope of the study and study limitations.

This study adopted a qualitative research approach. This is because the study was interested in investigating the perception of people as well as their relationship with wetland resources as a source of food security to sustain their livelihoods. The study specifically engaged with 67 members of the community with better knowledge of the resources found in iSimangaliso Wetland Park wetlands. In addition to this, the different stakeholders that play a major role in resource management, wetland conservation, and as well as food security were part of the population for this study.

This study included interaction with various respondents and considered theories and case studies to get a better understanding of the topic under investigation. The main data sources for this study were existing literature regarding the deterioration or degradation of iSimangaliso Wetland Park caused by agricultural activities taking place at the wetland. Different government officials responsible for wetland ecosystem protection and conservation; as well as officials responsible for food security were part of this study. Members of the public were also selected as sources of data for this study.

Snowball sampling together with purposive sampling was the technique used to select respondents. The first respondent was purposely selected by the researcher. The researcher purposely selected the members of the public based on the referrals provided by the first selected respondent with more knowledge regarding the activities occurring in iSimangaliso Wetland Park and the interaction between the public and the resources found in iSimangaliso Wetland Park.

The key data collection methods that were used in this study include interviews, questionnaires, and field observation. Data analysis involved a description of things, events, people, and the properties that best characterize them.

More in-depth details of methodological consideration of the study are provided in chapter three.

1.7 Delimitations

This research was conducted and limited to Kwazulu-Natal in particular to iSimangaliso Wetland Park in Umhlabuyalingana. Furthermore, the study involved the participation of the local community drawn from Umhlabuyalingana and working in the wetlands at iSimangaliso Wetland Park. In addition, the other participants are drawn from local authorities, different government officials responsible for wetland ecosystem protection, management, and conservation, as well as officials responsible for food security.

1.8 Ethical Consideration

Ethical considerations in every research process have become an important component to consider. This is because research has the potential to infringe on people's rights, values, and needs. Therefore, for a study of this nature the researcher communicated both verbally and in writing with the informants about the objectives of the study and how the data will be used. The researcher further requested written permission from informants to proceed with the study. Creswell (2014) argues that the research attacks the life of the source when the participant's position and foundation are exceedingly visible and sensitive data is often possible to uncover. Therefore, it is important to ensure that the rights, needs, values, and desires of the informants are respected.

In view of this, the researcher considered important to obtain ethical clearance before the study was commenced. This study requested ethical clearance from the ethics committee of the University of the Witwatersrand, who decided that the research met ethical prerequisites relating to people. The research proposal together with a consent form, participant information sheet, and interview questionnaires was submitted to the university's ethical committee. The informant's right to withdraw and interest to participate were considered. The

right to anonymity and confidentiality were communicated with the informants and it was of high importance in this study.

1.9 Structure of the dissertation

This dissertation starts with chapter 1 and ends in chapter 6. Chapter 1 introduces the topic and gives a brief summary of the whole study. Chapter 2 reviews the literature and debates revolve around the topic of the role of permaculture in promoting sustainable livelihoods and ecological conservation. Chapter 3 presents the techniques or methods that were adopted in this study. The research positionality, study population and sample procedure, data collection tools and data analysis and display the scope of the study and study limitations. Chapter 4 presents empirical evidence that was discovered by the researcher. Chapter 5 analysis the empirical evidence presented in chapter 4, linking it to the literature debate findings. Chapter 6 concludes the topic and provides recommendations for further research and intervention.

CHAPTER TWO

THEORETICAL CONSIDERATION & LITERATURE REVIEW

2.1. Introduction

This chapter provides a review of the literature and theoretical debates revolving around this study. Emphasis will be on engaging with literature that examines permaculture as a sustainable agricultural approach that reduces poverty. This study will also be dedicated to present literature on how permaculture practices can be used to promote sustainable livelihoods and how permaculture tools can be used to integrate agricultural productivity and wetland conservation. Lastly, the literature on global and local perspectives of the permaculture methods will be examined in this study.

Permaculture is a method that means different things to different people depending on their views and their interaction with permaculture strategies. The concept of permaculture came up with Bill Mollison and David Holmgren to portray integrated environmental management of enduring or self-sustaining plant and animal species valuable to man (Holmgren, 2007). Veteto and Lockyer (2008) define permaculture as a holistic system of design, based on direct observation of nature, learning from traditional knowledge and the findings of modern science embodying a philosophy of positive action and grassroots education. Veteto and Lockyer (2008) correspond to the three main permaculture ethics, whose aim is to take care of the natural environment, take care of the people, and distribute a fair share of the economy amongst the individuals in the community.

Permaculture seeks to empower the community to rely on one another and, in the process, to calm the social injustice and ecological degradation made by the worldwide political economy (Veteto and Lockyer, 2008). This can be done by applying the notion of thinking globally and acting locally, where people are

encouraged to take responsibility for themselves and the economy that supports them and by planning and practicing lasting, sustainable culture and agricultural systems made as per environmental knowledge.

Permaculture design an ecosystem through the principles of ethics in order to provide adequate necessities to sustain the environment and human needs and wants while expanding the economy for the future generation (Akhtar et al., 2015). This becomes successful when people are working together to reduce workload, by arranging and sorting out a social organization and encouraging people to work as a team, resulting in people working without an over-exploitation of resources with no come back to a structure of elevated remaining tasks at hand (Akhtar et al., 2015).

Veteto and Lockyer (2018) gave a case study of Earthaven Eco-village which is an example of a successful implementation of the permaculture methods to improve people's livelihoods. Earthaven Eco-village utilized permaculture as one of the fundamental instruments for building bridges between worldwide social and ecological awareness concerns and the development of nearby, sustainable practices.

Fehér and Beke (2013) state that today, Earthaven has developed to more than 60 individuals, 45 of whom live on the land, step by step executing cultural, social, political, financial, and innovative tests in sustainability. Earthaven's individuals adopted permaculture's ethics principles by living more publicly and substantially closer to the economic resources that manage them which makes it differ from most of the developed countries in the world. Although some of them live in an individual private place, they meet up to eat, socialize, and administer themselves in common building structures and spaces. These individuals share basic waste preparing and water conveyance systems, that they develop and look after themselves, notwithstanding producing as much of their own food, energy, and material goods as they can.

Veteto and Lockyer (2008) argued that even though permaculture strategies seem to be eco-friendly, eco-villagers also encounter challenges in terms of

getting enough working systems on the ground that they can make informed choices based on actual experience and begin to demonstrate bio-regionally appropriate culture for their time and place. Making and consolidating ecologically competent forestry and cultivating while in the meantime making customary building systems that conserve forest prosperity, make occupations and deliver maintainable power sources through incredible arrangement has proved to be quite an ambitious undertaking. However, Holmgren (2012) on the other hand, is of the view that permaculture is not limited to eco-village development or energy-efficient building, landscaping, sustainable farming, or skills of organic gardening, but its principles and methods can be used by households and communities to establish, design, manage and improve an environment towards a sustainable future.

2.2. Permaculture Flower

Permaculture flower is a summary of permaculture concepts that unites humanity with the complex system of nature. The permaculture design system flower journey starts at a local level then proceeds to the collective and global levels to create a sustainable culture (Holmgren, 2007). Permaculture flower is based on permaculture ethics and design principles that are applicable to the farm wilderness and to the city balcony (Namuli, 2011). Permaculture is a design system that aims at sustaining both the present and future generations by providing food, energy, shelter, material, and non-material needs while taking into consideration the natural environment (see figure 2.1). This is done by assessing the use of resources that supply our everyday needs.

The permaculture flower is developed by the constantly changing application of principles required to sustain people through the flow of energy (Holmgren, 2007). Overtime permaculture has increased to cover all aspects of sustainable living such as self-sufficient energy design, bio-intensive food production, and houses made from natural materials with sustainability as a key principle (Namuli, 2011).

The spiral evolutionary path of permaculture flower moves outwardly to connect all domains into an integrated pattern that creates a sustainable environment. The spidery nature of this flower proposes the unpredictable and variable nature of the process of integration (Holmgren, 2007).

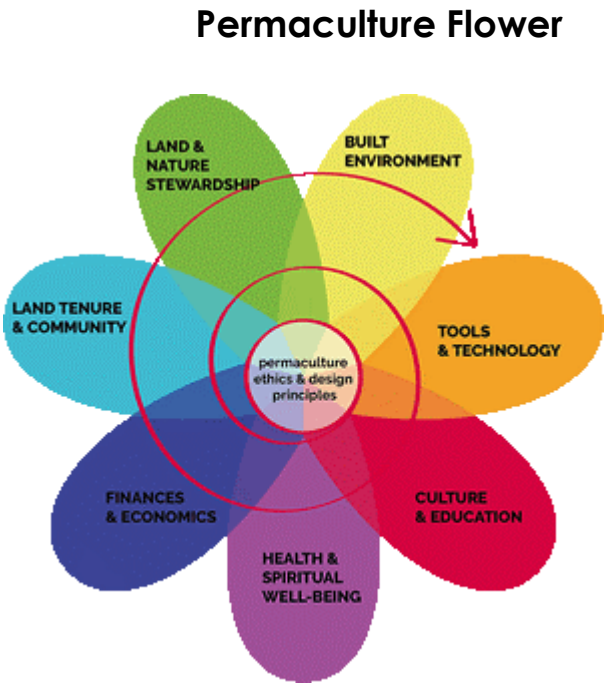

Figure 2.1 Permaculture flower (**Source**: Holmgren, 2007).

Permaculture is an ethical design philosophy that promotes a holistic approach to agriculture in particular, and to the human culture as a whole, strengthening and embracing the farm-ecosystem while generating healthy agricultural outputs as well as social and ecological benefits (Bemmel et al., (2017). Permaculture activists advocate for ethical and holistic permaculture strategies that do not pollute the land, products or surrounding water sources, but strengthen them and require a low input farming system (Bemmel et al., 2017; Holmgren, 2007). These permaculture strategies often improve the soil fertility and water retention capacity by encouraging the creation of the permanent cover of productive photosynthetic activity that protects the soil. This allows the vegetation below and above the ground to store carbon in its biomass in order to create the diversity that will lead to the system's resilience. The organic crops produced from this

method can be harvested throughout the season, while genetic diversity is protected (Bemmel., 2007).

Permaculture design principles are guided by ethics related to social, economic and ecological justice. The three main permaculture ethics are care for the earth, care for people, and fair share. The values of these permaculture ethics are realized through its practical applicability in real-life situations. The explanation of how these values are applied by farmers to improve their livelihoods while conserving what they have for future generations is stated below:

a) Environmental values (care for earth): Permaculture farmers grow their food based on working with natural cycles of the environment to mimic natural ecosystems. Permaculture farmers adopt a multi-function strategy that mutually supports and benefits all parts of the ecosystem and the local communities. Environmental values such as improvement of soil health; protection of genetic diversity; increase in diversity are noted from this example.

b) Social values (care for people): Permaculture promotes the concept of understanding and viewing society as part of nature. Permaculture principles provide both active and passive benefits to society. They provide passive benefits in the form of recreational functions provided by attractive landscapes that contribute to the local economy. Active values include the provision of the food production system that involves the design of food forest and the creation of an ecosystem that mimics those plants found in the natural environment and having different edible vegetables, herbs, and fruits designed to meet human needs (Krantz, 2011).

c) Knowledge and competence value (fair share): Permaculture initiatives promote the working together of different stakeholders where knowledge is shared. Permaculture farmers are encouraged to take part in programs involving the exploration of opportunities in the form of taking courses, engaging with relevant government institutions and attending educational farm tours in searching for a better understanding of the environment they are working on

(Bemmel et al. (2007). Another example that demonstrates fair share is the design of an ecosystem by permaculture principles that provide enough necessities to sustain both the environment and human needs while expanding the economy for future generations. The fair share values that are discussed here include the share of knowledge, resources, economy, and ecosystem services.

2.3. The role of the permaculture methods in promoting sustainable livelihoods

This section first reviews the literature on the meaning of the word livelihood in order to have a better understanding of its relationship with permaculture and how it can reach a sustainable state. According to Serrat (2017) and Farrington et al. (1999) livelihood refers to both social and material resources and activities such as water, food, clothing, shelter, and medicine required for the way of life. Livelihood is evaluated by assessing how an individual, a family, or a community carries themselves under certain conditions (Elasha et al., 2005). Serrat (2017) argues that in order to understand livelihood one must examine the coping and adaptive systems sought after by individuals and communities as a reaction to external stresses and shocks, for example, drought, policy failures, and common hardship.

Livelihood is regarded as sustainable when it can adapt to and recover from stresses and shocks and keep up or upgrade its capacities, its resources, and as well as its activities both now and in the future, while not threatening the natural resource base (Farrington et al., 1999). The concept of sustainable livelihood came up with the Brundtland Commission as a way of connecting socioeconomic and ecological considerations together with relevant policy structure (Kratz, 2001; Carney, 2001). Sustainable livelihood simultaneously addresses the issue of development, sustainable resource management, and poverty eradication with its main focus being the rural areas where people make a living out of primary self-managed production (Krantz, 2001). The sustainable livelihood approach contains ethical principles that encourage the prioritization of poor people.

Poor people are the ones who experience social vulnerability the most in society. This is due to the fact that they have limited capacity to protect themselves from environmental hazards and extreme events such as drought, flood, and consequences of large-scale environmental changes, such as biodiversity loss, land degradation, and climate change (Fischer et al., 2002). Human vulnerability is caused by poverty and the lack of sufficient income to buy food that will sustain their households. Thus, hunger and food insecurity results in lower labor productivity, reduction in disease tolerance, and low education achievements (Fischer et al., 2002; Chamber 1988)

Carney (2001) is of the view that sustainable livelihood seeks the ways of amplifying the voice of the poor by demanding longer time frames, capable of meeting the demands of development initiatives that are flexible and dynamic enough to respond to poor people's needs. Chamber (1988) supported the notion of putting poor people first by stating that the needs of the very poor need to be looked at first before addressing the issues of environmental conservation, sustainable resource exploitation, rural development, and population control. Carney (2001) argues that the sustainable livelihood approach adds value to the efforts of poverty reduction by putting more attention on identifying and addressing the gaps found in the institutional and organizational policy structure. Carney (2001) further argues that this challenges the development agency's structure, work ethics and agency personnel skill requirements; by doing that, sustainable livelihood stresses the need for institutions to work in ways that reflect the reality of poor people's livelihoods.

Permaculture promotes sustainable livelihoods by rebuilding a society and managing resources necessary to sustain people's lives and provide basic needs like water, food, shelter, and working environment, to common individuals in the communities (Barrette (2011). Permaculture recreates a world without destruction and pollution by encouraging people to take responsibility for their actions and change the behaviors of consumption and exploitation of natural resources (Namululi, 2011).

Permaculture design promotes sustainable livelihood by recognizing energy and nutrient systems that are inherently leaky, and design components, elements, structures, and plants to minimize or reduce the leakage from the system (Namululi, 2011). This is because permaculture strategies integrate social, economic and cultural factors into the context of food production. Permaculture food production system involves the design of food forest and the creation of an ecosystem that mimics those plants found in the natural environment and having different edible vegetables, herbs, and fruits designed to meet human needs. According to Krantz (2011), the food forest also contains plants and resources useful for building, clothing, fuel, medicine, decoration, animal fodder, etc.

According to Veteto and Lockyer (2008), Permaculture is a sustainability movement that contains a group of ethical principles and design guidelines and techniques for creating a sustainable, permanent culture of agriculture. Permaculture is designed based on direct observation of nature and learning from traditional knowledge and modern scientific findings in creating an ecologically sound and economically prosperous community. Permaculture restores society by giving back control of resources necessary for living such as food, water, shelter, soil, energy and the means of livelihood to ordinary people in the community (see figure 2.2.).

Figure 2.2.: Permaculture diagram (Source: Barrette, 2011)

Holmgren (2007) states that permaculture is a system of people and gatherings spreading permaculture principles in both rich and poor nations all around the world. Regardless of permaculture's ability to sustain livelihoods and promote ecological conservation, there is still a large gap in knowledge regarding the successful implementation of permaculture in a large population with limited resources. For this reason, permaculture activists are adding to a more eco-friendly future by rearranging their lives and work around permaculture design principles. Akhtar et al. (2014) point out that the basic principles of permaculture encourage one to begin where they are and utilize what they have in order to sustain their livelihoods. Krantz (2001) highlights that permaculture is an arrangement of requests, not a disorder. It grows out of an arrangement of principles taken from cautious perceptions of nature. When these principles are properly applied, they make a wonderful, useful, and eco-friendly environment.

There is nothing that is totally wasted or lost in nature when permaculture strategies are properly implemented. Regardless of how drained the nearby condition may appear, there is a considerable amount to expand on (Akhtar et al., 2014). Barrette (2011) supports these statements by encouraging individuals to recognize the resources at hand and exploit those before purchasing anything else. Barrette (2011) further states that It might be shocking how much potential a nearby look uncovers. Consequently, permaculture activists are currently making small neighborhood changes starting from activities affecting the fields of sustainable development, to natural agribusiness, to the use of technology, and the redesigning of the community.

Holmgren (2007) argued that permaculture sustains people's livelihood by focusing on the interconnection of plants and animals that are suitable for human wants. Akhtar et al., (2014) argue that permaculture strategies contribute towards making a positive change in sustainable management. This is because permaculture strategies are fit for resource management, ecological conservation, and financial improvement. In view of this, therefore, permaculture is one of the methods that support sustainable livelihoods, and consequently worldwide sustainable development (Barrette, 2011).

2.4 The role of permaculture strategies in promoting ecological conservation

The basic permaculture principles revolve around finding ways and strategies that promote environmental well-being and ecological conservation. According to Fischer et al. (2002), human activities cause environmental vulnerability in all ecosystems. These human activities contribute to the change in climate and have a negative impact on the agricultural system, thus leading to poor food production. The viability of an ecosystem is determined by its ability to adapt to the changing environment. Global warming and climate change that the world is currently facing contributes the most to the damage of land and water ecosystems and loss of production potential. These environmental changes trigger depletion in soil fertility, degradation of forest resources, water resources, pastures, and fisheries (carney, 2001; Fischer et al., 2002).

The agriculture sector is the one that is affected the most by these environmental changes. Consequently, agriculturist focus more on challenges such as the changes in the flow and storage of material, ecology of pest and diseases, dynamics of rainfall regimes and water accumulation, plant responses to temperature and carbon dioxide concentration, reduction of greenhouse-effect gases, plant salt tolerance affected by intrusion of saltwater due to sea-level rise, conservation of biodiversity, and adaptation of food production systems to extreme weather events (Fisher et al. 2002). However, agriculture practices have the most powerful influence on environmental quality and are also responsible for sustaining poor rural livelihoods in most developing countries. Garcia-Barrios and Garcia-Barrios (1990) argue that poor agricultural practices together with rural population growth, and income growth projects hinder the environmental improvements and rural poverty reduction causing an imbalance between the consumption needs of the rural poor people and their capacity to fulfil them with sustainable agriculture. Population growth and limited access to land and limited resources for investment increase pressure on natural resources resulting in

environmental degradation that leads to a decrease in food security for poor people (Scherr, 2000).

Rout et al. (2010) state that agriculture intensification, on the other hand, increases soil erosion, nutrient depletion, water quality and soil organic matter depletion in sensitive ecosystems and in places that have been intensively cultivated and where the majority of the population is dependent upon the land to sustain their livelihoods. Agricultural activities also contribute to methane and nitrous oxide emissions. However, the problem of agriculture intensification is viewed differently by farmers depending on farmers' personal characteristics, feelings, and farmer's access to technological methods of production (Scherr, 2000). Environmental management practices are determined by the farmer's household size, income source, and social background (rich or poor). Rout et al. (2010) argue that poor households who solely depend upon agriculture as a source of food security and source of income may easily consider environmental management practices in order for agriculture to continue sustaining their livelihoods. On the contrary, rich households whose income sources are diversified may not be concerned about land conservation as their livelihoods are not primarily based on agriculture. In view of the above consideration, land use management that controls the process of land degradation and promotes the flexibility of diversification and develops a broad genetic base that ensures the possibility of rapid response to changing conditions needs to be adopted to ensure sustainable agriculture (Fenwick, 2007).

Wetlands are among the world's most productive and valuable ecosystems that support agricultural production, through the supply of reliable water and arable soil required for farming (World Wetland Day, 2014). Wetlands provide a wide range of economic, social, environmental and cultural ecosystem services. These ecosystem services include maintaining water quality and supply, regulating atmospheric gases, sequestering carbon, protecting shorelines, sustaining unique indigenous biota, and providing cultural, recreational and educational resources (Dise 2009). wetlands play a fundamental part in local and global water cycles

and are at the heart of the connection between water, food, and energy, a challenge for our society in the context of sustainable management.

According to Namululi (2011), permaculture is an ecologically driven management strategy that increases the sustainability of agricultural productivity and promotes ecosystem conservation while greatly reducing off-site consequences. Permaculture provides a practical solution to environmental problems such as soil erosion and desertification. Barrette (2011) argues that permaculture can minimise soil erosion by growing tree crops or other perennials on a steep slope and by adopting a no-till farming method. Permaculture strategies can address the desertification problem by introducing people in dry areas to gardening and start growing trees, as trees have the ability to make rain. Namululi (2011) points out that other permaculture strategies that promote ecological conservation include the replacement of field ploughing with no-dig beds, which reduces weeds and requires very little maintenance and minimizes soil disruption.

Permaculture has strategies like cultural keystones that promote the conservation of the environment. Ecologists perceive keystone species to play a major role in the general structure and working of an ecosystem (Garibaldi and Turner, 2004). In human societies all over the world, there are plants and animals that shape the relevant underpinnings of a culture, as reflected in their crucial roles in eating regimen, as materials, or in medicine. Furthermore, these species frequently highlight prominently in the language, ceremonies, and accounts of local people groups and can be viewed as cultural icons (Garibaldi and Turner, 2004).

Sundar and Kittur (2013) argue that since permaculture is based on ethical principles, cultural keystone species are used and harvested in substantial amounts and intensively managed for quality and productivity. The values that are attached to cultural keystone species represent a significant part of human culture, which may encourage people to have more interest in general conservation and restoration endeavors related to cultural keystone species. The study by Garibaldi and Turner (2004) is of the view that recognizing and promoting

a socially arranged idea such as cultural keystone species that adjusts itself to a commonly known concept already used in ecological debates permits more successful communication among each one of those with interests in biocultural conservation and restoration. Garibaldi and Turner (2004) further argue that this permaculture strategy promotes the improvement of a more holistic point of view of ecosystems and gives one more road through which to emphasize the significance of species and habitats to specific groups of people and to all humankind.

Reviewing literature regarding wetland conservation at a local level was a crucial component of this study as it contributed a lot in reviewing the study gap in knowledge and further contributed to future study recommendations. Jogo and Hassan (2010) state that wetlands in Southern Africa keep on being deteriorated and lost through transformation to agriculture and other uses. One of the real imperatives to the sustainable management of wetlands in the region is that wetland users and leaders have lacking knowledge of the outcomes of alternative management and approach routines on wetland working, ecosystem services, and human prosperity. Sundar and Kittur (2013) put forth an argument that this is because more consideration is being directed at discovering the estimation of large wetlands officially thought to be critical, and towards wetlands that are a part of the national protected area network. For this reason, therefore, an unbiased understanding of how farming in wetlands, in general, might contribute towards conserving and maintaining biodiversity is absent.

Jogo and Hassan (2010) further argue that the capacity of wetlands to store water during the wet season and discharge it during the dry season gives agriculturalists living in semi-dry zones chances to develop crops throughout the year in this manner enhancing their food security and incomes. Other than yield creation, wetlands give different services that help human welfare, for example, livestock grazing and watering, water supply, fishing, and natural products.

Several authors stress that permaculture promotes sustainable wetland management by diversifying livelihoods obtained from agricultural activities

found in the wetland ecosystem. Sundar and Kittur (2013) put forth the argument that livelihood diversification can be promoted through expanded government investment in rural infrastructure, downstream value chains, wellbeing, and education. Sundar and Kittur (2013) further argue that a pure conservation strategy that goes for securing the wetland leads to considerable decreases in the economic welfare of the local population except if their livelihood sources are diversified into alternative non-cultivate business and payment options.

Global warming contributes to the decrease in precipitation in South Africa causing environmentalists to anticipate an acceleration in the conversion of wetland ecosystems to the agriculture field, thereby undermining wetland conservation endeavors (Hassan, 2010). Thus, Permaculture principles motivate rural farmers to adjust to environmental changes like the drought in order to limit pressure on wetland resources. According to Jogo and Hassan (2010) permaculture strategies that lessen reliance on wetlands for agriculture such as interest in water harvesting and storage, efficient water system strategies, and promoting utilization of drought-tolerant crops and diversifying out of farming ought to be promoted.

Permaculture design principles are used to promote the conservation and restoration of the wetland ecosystem. One of the strategies that promote wetland conservation and restoration is a wetland ecosystem treatment strategy. Wetland ecosystem treatment systems specialises in the development of sustainable, energy-efficient, ecological-oriented wastewater management solutions. Abrahams et al. (2017) argue that the wetland ecosystem treatment system strategy was developed as a reaction concern about worldwide changes in the atmosphere and local climate designs, biodiversity loss, and future constraints of energy decrease. Holmgren (2007) states that this permaculture design strategy is a positive plan logic and the principles behind it perceive that the harm done to the earth's environment can be repaired.

CHAPTER THREE

METHODOLOGICAL CONSIDERATION

3.1 Introduction

This chapter is dedicated to describing the research processes that guided this study. The methods used in undertaking the research and the reasons for the choice of methods employed are discussed in this chapter. This chapter starts with an explanation of the research philosophy selected for this study. This section then provides a summary of the research aim and objectives in order to revisit the research focus. Thereafter, it discusses the research design followed by describing the study population and sample procedure. Other components such as the data collection process and the process of data analysis are explained further in this chapter.

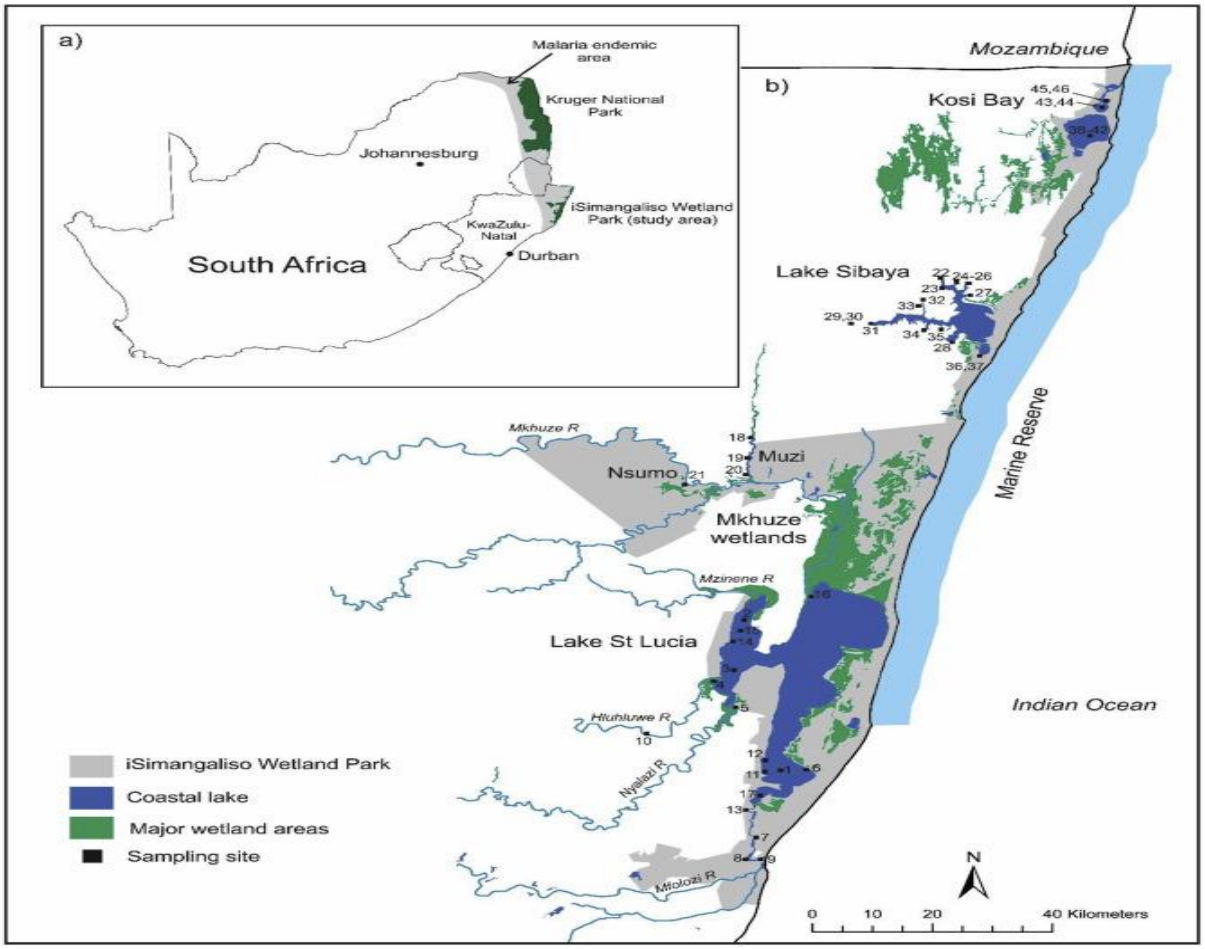

Figure 3.1: A map showing the research site: iSimangaliso Wetland Park.

3.2 Description of the study location

iSimangaliso Wetland Park is located on the waterfront plan that makes up north-eastern KwaZulu-Natal in South Africa (27°15'S-27°25'S and 32°32'E-32°44' E), and is the nation's biggest natural freshwater wetland, with a zone of 60 – 70 km^2 (23–27 square miles) (UNEP, 2006). iSimangaliso Wetland Park is barely isolated from the ocean by a scope of high forested beachfront rises. The surface water in the encompassing beach front plain regularly disappears totally in the dry years, making the wetland the main lasting source of water for mammals and birds (UNEP, 2006).

iSimangaliso Wetland Park falls under the Umhlabuyalingana municipality which is 3 964 km^2 with a population of 156 736 (Statistics South Africa, 2011). The municipality is very poor and crowded by the continuous influx of migrants from Mozambique and Swaziland coming to search for a better life in South Africa. The municipality experiences challenges in delivering services to the community in a short period of time leading to a massive service backlog. The high population growth and shortage of service delivery in the area led to poor infrastructure and shortage of housing. Areas like Mbazwana and Manguzi are extremely rural with informal settlements.

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According to the 2019 KwaZulu Natal top business report, agriculture, and tourism are the main economic contributors to Umhlabuyalingana municipality. Agriculture as one of the main contributors to the municipality economy faces a lot of challenges. These challenges include the lack of enough water for irrigation schemes, lack of proper infrastructure to access agricultural production areas, and lack of external and internal markets for crops. Umhlabuyalingana municipality is rich in natural assets that attract tourists from all over the world. The municipality has many heritage sites, that include iSimangaliso Wetland Park's St Lucia Lake, Lake Sibaya, Kosi Lake System, Ndumo Game Reserve, Sodwana Bay,

and Tembe Elephant Park. These natural assets make tourism to be another contributor to the municipality economy.

According to UNEP (2006), many of the region's rural communities totally rely on iSimangaliso Wetland Park wetlands flora and fauna to sustain their lives. Agriculture in the iSimangaliso Wetland Park wetland catchment and along its seepage lines cause disintegration, eutrophication, contamination, and wetlands deterioration around the wetland raising worries among environmentalists (UNEP, 2006). Although iSimangaliso Wetland Park has been assigned a wetland of worldwide significance, there has been no contribution by the community around the wetland to protect the indigenous species found in the region or practice sustainable management.

Broad development and deforestation in the wetland's catchment region have expanded erosion and eutrophication in most of the waste lines encouraging the wetland ecosystem. UNEP (2006) further stated that a lot of poor nearby communities consider logging to be a method for enhancing their way of life, prompting the careless consumption of huge zones of backwoods.
In view of the above considerations, this study investigated strategies that can reduce the pressure on wetland resource consumption while at the same time sustain the needs of this poor community. Umhlabuyalingana municipality was a suitable site for this research because it is a very poor municipality with a community that relies on agricultural products and fauna and flora found in the iSimangaliso Wetland Park wetlands to sustain their livelihood. Although agriculture is argued to be the main economic contributor to the Umhlabuyalingana municipality, it faces challenges such as shortage of water which hindered agriculture's ability to sustain the community.

In view of the above consideration, these poor people look for the nearest fertile soil and water accessible place to practice farming which, unfortunately, in this case, is the iSimangaliso Wetland Park wetlands catchment area. This has

negative impacts on the wetland ecosystem as wetlands used for agricultural production can be poorly managed. Therefore, this study investigated how permaculture as found to be an agricultural approach that cares for people, cares for the environment and cares for the distribution of resource surplus, can its methods be adopted to ensure that livelihoods are sustained at Umhlabuyalingana and at the same time wetlands are conserved in iSimangaliso Wetland Park.

3.3 Research philosophy

This study adopted a qualitative research approach. This is because the study was interested in investigating the views of people towards sustainable resource management and conservation as well as their interaction with wetland resources as a source of food security to sustain their livelihoods. A qualitative research approach involved investigating and understanding the importance of people or gatherings regarding social or human issues. An approach by Baxter and Jack (2008) was adopted where the qualitative research procedure included the development of open-ended questions and techniques, the information was regularly gathered in the participant's setting, data analysis was characterized by details of general themes, and the researcher making translations of the importance of the information. The last composed report in this research approach has an adaptable structure.

This research was informed by constructivism, narrative research, and phenomenological research. Constructivism was adopted to investigate the participants' understanding regarding the world in which they live and work (Creswell, 2014). Constructivism was designed to communicate with different people in a manner that participants can construct the importance of circumstance while responding to wide and general questions. The benefits of constructivism is that it is the nearby joint effort between the researcher and the participants which allows the participants to recount their stories (Baxter and Jack, 2008). Through these stories, the participants can depict their perspectives

of reality and this empowers the researcher to better understand the participant's activities. Narrative research was adopted to study the lives of people and ask at least one person to give stories about their lives. These stories from the participants form the data that is then regularly retold or reported by the researcher into a narrative order. The researcher used constructivism and narrative research to engage with Mbazwana community members by allowing them to share their experiences in relation to wetland resources as a source of food security that sustains their livelihoods.

The methodological approach that was adopted for this study is phenomenology. Phenomenological research begins with some ideas of the phenomenon the researcher wanted to investigate (Creswell, 2014). The phenomenon is then investigated, and emergent themes are compared for similarities and differences with the researcher's initial pre-understanding. In this study, the pre-knowledge of the phenomenon (iSimangaliso Wetland Park) under investigation was restricted to existing literature and engagements with other people about the phenomenon. The prior knowledge obtained from the reviewed literature and research participants helped the researcher in the interpretation of the information obtained about iSimangaliso Wetland Park and also gave the researcher an opportunity to compare the researcher's observation with the participant's views. Phenomenological research was adopted by a researcher to depict the lived encounters of people about a phenomenon as portrayed by participants through interviews (Baxter and Jack, 2008). Ethnography which is another philosophical positioning informing this study was adopted to investigate the mutual pattern of practices, language, social interaction, and culture in a characteristic setting over a long timeframe. Data in these methods was collected through interviews and observations.

3.4 Recapping the research aims and objectives of the study

As discussed in section 1.4, the research was originally interested in investigating how permaculture and the methods that are used in this agriculture system can be used as a strategy to promote sustainable agriculture as well as food security,

and while at the same time, promoting ecological conservation of wetlands. This study exclusively focused on the case study of iSimangaliso Wetland Park which is located in Umhlabuyalingana northeast of KwaZulu-Natal. This research was specifically targeted at understanding the role of permaculture and its methods in promoting food security; identifying ways in which permaculture aligns agricultural productivity with wetland conservation, and lastly, investigating ways in which permaculture promotes wetland conservation.

3.5 Research design

A comprehensive explanation of the researcher's experience in the journey of data collection is found in this section. In this particular study, the sources of data were existing literature together with the relevant informants that helped the researcher to get a better understanding of the phenomenon under investigation. The main data source was existing literature regarding the deterioration of iSimangaliso Wetland Park. The literature on permaculture as an agricultural method that can help in the restoration and conservation of wetlands while at the same time caters to the needs of the community was reviewed. Selected members of the community were part of this study. Their information helped in comparing and contrasting the data already obtained in literature for harmony and contradiction. Thereafter, the data analysis techniques are discussed, and the conclusion is provided to close the chapter.

3.5.1 Study population and sampling procedure

In this particular study, iSimangaliso Wetland Park management, Umhlabuyalingana Municipality, Local chief or headman, non-governmental organizations, commercial and subsistence farmers form part of the targeted population, because of their involvement in the management and conservation of the wetland, and as well as their responsibility in sustaining the livelihood of the local community. ISimangaliso Wetland Park management formed part of the targeted population because of its mandate over the protection and management of natural resources on and around iSimangaliso Wetland Park.

Umhlabuyalingana municipality officials and local chiefs have the responsibility of ensuring that the needs of the community are taken care of, in terms of food security and their community's general well-being, which made them suitable for this study. Commercial and subsistence farmers formed part of the population because of their involvement in the use of wetland resources for farming. Local community members living around the wetlands and using wetland resources to sustain their livelihoods were selected to be part of the study population. Non-governmental organizations and associations were other key respondents selected for this study because of the part they play in resource management and food security in the communities around Umhlabuyalingana municipality.

3.5.1.1 Sampling procedure

The sampling procedure involved choosing individuals in a population to represent the whole population as it is difficult and time-consuming to speak to everyone in the population. The individuals that were selected to be part of the population were chosen based on meeting the minimum participation criteria.

The criteria for selecting respondents in this study was based on the following:

I. The person must be a permanent resident of Mbazwana location (Mbazwana is the community that is adjacent to the study site)
II. One must have the knowledge of agricultural activities taking place at Mbazwana location and on the surrounding wetlands.
III. And must have visited iSimangaliso Wetland Park or utilized any available resources found at the wetland.

This study adopted purposive sampling to conduct this research. According to Palinkas et al. (2015), purposive sampling is widely used in qualitative research for the identification and selection of information-rich cases related to the phenomenon of interest. This type of sampling targets subjects or individuals that are available and willing to participate and have the ability to be expressive and communicate experiences and opinions in a reflective manner (Creswell & Plano

Clark, 2011). In the case of this research, the researcher was more interested in an in-depth understanding of the world through the eyes of the research respondents, rather than its statistically representative sample.

iSimangaliso Wetland Park is made up of around 3.280 km^2 of natural ecosystems stretching across 280 km of coastline, from the Lake St. Lucia estuary south of KwaZulu Natal to the borders of Mozambique (UNESCO). For the purpose of this study, the research focused on Lake Sibaya which is one of the wetlands found in iSimangaliso Wetland Park. It is estimated from South African statistics (2011) that 431 people from Mbazwana Location live around Lake Sibaya. In view of this, therefore, it was purposely decided to use 18% as the margin of error that determined how many individuals selected to form part of this study. It is illustrated below how the researcher calculated the sample size from the whole population:

N = Sample size

P = Target study Population

M = Margin of error

N = P/M

N = 431 (18/100) = 78

The researcher worked with an organization called Fancy stitches to purposely select respondents based on the research criteria stated in section 3.4.2. This organization is involved in many different projects that are run by community members. The researcher visited these projects together with this organization member and got the opportunity to engage with community members working on these projects. The researcher conducted focus group interviews with these community members, with each group consisting of five members with the researcher chairing the discussion.

The sample population for this study consists of three groups: 1. Government officials and local chief who are responsible for sustaining local people's livelihoods; 2. ISimangaliso Wetlands Park officials responsible for wetland

conservation and restoration; and 3. Local community members that live around iSimangaliso Wetland Park wetlands and use wetland resources to sustain their livelihoods. The research engaged with a total of 78 (seventy-eight) respondents out of the 100 (one hundred) respondents that the research initially proposed. 67 (Sixty-seven) of the total respondents were community members, 8 (eight) respondents from non-governmental organizations, 1 (one) from Umhlabuyalingana municipality and 1 (one) from iSimangaliso Wetland Park.

The above-mentioned respondents were purposely selected and identified based on the criteria of being information-rich regarding the phenomenon of interest. The government officials were contacted by emails requesting to personally interview them at a time and place suitable for them. ISimangaliso Wetland Park officials were first contacted telephonically seeking permission to interview them and later emailed questionnaires that they filled by themselves since they were not available for a face-to-face or telephone interview. Local community members and Local chief were contacted verbally by the researcher seeking permission to conduct the research from the chief and inviting community members to participate in this study interview session. The researcher verbally communicated and explained the research aim to all the key informants prior to the commencement of the investigation and the consent form was signed by participants giving the researcher permission to conduct the study.

The snowball technique was used as an additional sampling method. The researcher used the snowball or chain referral approach to identify suitable individuals to participate in this study. According to Bangheri and Saadti (2015), the chain referral approach uses social links to identify a sample of people that are hard to reach. This is achieved by purposely selecting an individual that will link the researcher to additional members who are knowledgeable about the research but are not easily found. For the purpose of this study, the snowball technique was useful with selecting the government officials, iSimangaliso Wetland Park officials, and community members. In the case of the government officials, the municipality manager's office was approached with an introductory letter containing the details of the research and request to seek an audience from

a relevant government official. The municipal manager's office referred the researcher to the right office to handle such an inquiry. The same approach applied with iSimangaliso Wetland Park officials, an introductory letter and a request to seek the audience was made. A response referring the researcher to the correct official was provided.

In the local community, the first person to be approached by the researcher was a member of Fancy Stitch that had been working on a similar project as a researcher for a long time. This individual was chosen based on the criteria of being information-rich regarding the dynamics of the study site and also for being an expert in the field of resource management and food security. Due to the strict laws, and regulations regarding meeting and seeking permission to conduct a study on land that is owned by chiefs, It was important for the researcher to be referred or introduced to the chief by this non-governmental organization member who is a well-known resident and has been working on the similar project as the researcher. The researcher got a chance to engage with community members of Mbazwana location when this non-governmental organization member took the researcher to see different projects that are part of community development in this area. The researcher was able to conduct a group interview with these different groups of people while doing the field observation and walking a mile in their shoes and see how these community members sustain their day to day lives.

3.5.2. Data collection tools

This section presents the various data collection tools that were used in this study. For the purpose of this study interviews, questionnaires and observations were used to collect information from the respondents:

a) Interviews

Interviews are one of the data collection tools that were mostly used in this study. Interviews allowed the researcher to be in direct contact with the participants through conducting a face-to-face interview, telephone interviews, or being involved in focus group interviews with more than five groups of people. Interviews are a valuable method for exploring a detailed account of human behaviour by allowing interviewees to speak in their own voices and express their own feelings and thoughts (Alshenqueet, 2014).

There are four types of interviews that were used in this study, namely: structured interviews, unstructured interviews, semi-structured interviews and focus group interviews. 1. Structured interviews involved a very organized type of interview that mostly requires a yes or no type of response (Alshenqueet, 2014); 2. Unstructured interviews contain open-ended questions that offer flexibility and freedom to both interviewer and interviewee and allows an interviewee to explain various issues (Creswell and Plano Clark, 2011); 3. Semi-structured interviews allowed flexibility to the interviewer by providing an opportunity for the interviewer to probe and expand the interviewee's response to get in-depth information (Creswell and Plano Clark, 2011) and 4. Focus group interviews involved the sampling of a specific population or group that will focus on a given topic with an interviewer chairing the discussion (Ashenqeet, 2014).

This study used structured and semi-structured interviews together with focus group interviews to get data from the respondents. In the case of this study, the researcher interacted with groups of Mbazwana community members where focus group interviews were used with the researcher chairing the discussion. In addition to this, the researcher needed in-depth information from Mbazwana community members and semi-structured interviews were used to allow the flexibility of a researcher to probe and expand the interviewee's responses. A face-to-face interview was conducted by the researcher with farmers and government officials using semi-structured and structured interviews. In this

particular study, Interviews were used because they provide first-hand undocumented information from the respondent.

b) Questionnaires

Questionnaires were a set of questions that were prepared and issued by the researcher to gather information from the respondents (Creswell, 2014). Questionnaires were a very convenient way of collecting useful comparable data from a large number of individuals. The questionnaires were made to be more effective by the consideration of the following: the literacy level of the respondents; the expected response; the availability of the resources; the population interest in the topic; and whether the questionnaire will be self-completed.

The literacy level of the respondents determined the number of respondents that can read and complete the questionnaires on their own with little supervision from the researcher. Therefore, it was important to ensure that the questionnaires were drafted in a manner that was easily understood by the respondents in order to increase the number of responses. It was also important to explain the research topic to the respondents so that they can understand what the researcher's aim was and what was expected from the respondents. Questionnaires in this study were used to gather information from the respondents who were not available during the interview session with the researcher. The questionnaires were drafted in a manner that was easily understood by the Mbazwana community members. The researcher left the questionnaires at the homes of the respondents, for them to answer at the time that was convenient for them and came back to collect them on the following day. The questionnaires were used because they increase the accuracy of the study by allowing households that were not present or did not have time to participate during the interview process to have a chance of participating in this study. Questionnaires were also drafted and emailed to the iSimangaliso Wetland Park management who were not able to have a face-to-face interview with the researcher because of their busy schedule. The

iSimangaliso Wetland Park management filled the questionnaires at the time that was convenient to them and sent the documents back to the researcher.

c) Field observations

Another data collection method that was used in this study was field observation. Infield observation, the researcher was in direct contact with the subject under investigation. The behavior and activities of the individuals at the study site were captured and recorded in an unstructured or semi-structured manner. The researcher in observations engages in the study as a non-participant or a complete participant. The field observation asks open-ended questions that encourage participants to provide their views freely. The researcher used field observation to physically participate in community projects and walk a mile in the shoes of the respondents to understand community situations better.

3.6 Data analysis

Data analysis basically involved characterizing things, people, events, and the properties which portray them. In this particular study, data analysis involved the continuous reviewing of questionnaires from Mbazwana community members and iSimangaliso Wetland Park management. Reviewing the recordings of government official's interviews, and transcription of taped interviews from focus group interviews with Mbazwana community members. This provided the researcher with a clear picture of the participant's views towards sustainable resource management and conservation as well as their interaction with wetland resources as a source of food security to sustain their livelihoods. The data were then compared and contrasted with prior knowledge of this study literature presented in chapter 2 to get a holistic interpretation of the role of permaculture in promoting sustainable livelihood and ecological conservation. The researcher analysed these findings by identifying and describing patterns and themes from the participant's point of view. Thereafter, the participant's responses were coded using the Microsoft Excel package. This data was tabulated using Microsoft Excel to produce a graphical representation.

3.7 Methodological reflection

This section discusses some of the researcher's methodological reflections. First and foremost, there were challenges in traveling to the research site. The research site that was identified and selected, was a site that was not familiar to the researcher. This is the site the researcher got interested in through literature and engagement with other people about the challenges of that area. Through engagement with other colleagues and organizations the researcher introduced to by her supervisor, it was possible for the researcher to travel to the research site. Therefore, the researcher networked with these colleagues who accommodated and transported the researcher on the field and later introduced the researcher to the community members and ensured that the research was done. Therefore, it is important to look at the obstacles and challenges that might come before you embark on choosing the research site that is further away.

Secondly, the researcher's study was funded by a sponsor that does not fund data collection field trips but provides a living allowance that is meant to sustain the researcher's needs while studying. However, the researcher had to use the living allowance for the field trip despite having personal and family responsibilities that the researcher usually used the allowance for. It is important that every research effort must consider many responsibilities that the researcher has in order to ensure that the research is not compromised.

For any research that is to be conducted in the traditional land a permit from the chief of the land is required. For this reason, therefore, the researcher needed to follow certain protocols to obtain this permit from the chief of the research site. However, it was not easy to obtain the permit because of the conflict regarding the ownership of the land in the research site. The researcher engaged with a trusted individual in the community who then represented the researcher to the local authorities, and it was only then that the researcher was able to interview community members.

Lastly, the researcher's plan of how the research should be conducted was changed and the structure of the interviewing process was altered. The landscape structure of the area could not allow a door to door interview section with the respondents because the households are scattered apart, and it would take a lot of time for the researcher to finish the study. The researcher took advantage of community meetings and project visits to interact with the respondents. The structured interviews with interview guide questions were to be changed at some point because the respondents were tired of engaging with outside people who come with clipboards and pens asking questions and don't see any change after. The researcher had to participate in some activities taking place at these projects to gain the respondent's trust and ask indirect questions during the conversations.

CHAPTER FOUR

EMPIRICAL EVIDENCE

4.1 Introduction

This chapter is dedicated to present the findings obtained from the data collection stage of this research. The discussions in this chapter are structured around addressing the research questions stated in section 1.3 of this study. The first subsection of this chapter will look at the role of permaculture in promoting sustainable agriculture and food security, followed by discussing the perspectives on community relations with natural resources. Thereafter, it will discuss ecosystem adaptation methods that promote wetland conservation and restoration. Lastly, methods that integrate wetland conservation and agriculture productivity will also be discussed in this chapter.

4.2 Assessing the role of permaculture in promoting sustainable agriculture and food security

This section gives a detailed response to how permaculture promotes sustainable agriculture and food security from the participant's perspective. The researcher asked the participants specific questions to guide each interview session. The questionnaires and interview guides used are found in the appendix (exhibit 1&2). Participants were asked in what ways can permaculture be used as a strategy that promotes sustainable agriculture and food security in Umhlabuyalingana, KwaZulu Natal? To answer this, the researcher investigated the respondent's gender, educational background, source of income and the person responsible for sustaining the household, in order to get a better understanding of which respondents use wetland resources frequently and their reasons for relying more on wetland resources for sustaining their households. The results are demonstrated in the tables below.

The gender of respondents was investigated in this study. A careful examination of table 4.1 reviews that most wetland users at iSimangaliso Wetland Park wetlands are women (72%).

Table 4.1 Represents the respondent's gender

Gender	Number of respondents	Percentage
Female	48	72%
Male	19	28%
Total	67	100%

Source: Based on field surveys (2019)

In view of the above consideration, it states that iSimangaliso Wetland Park is predominantly used by women for farming purposes. It was important to investigate why these women from Umhlabuyalingana still rely on wetland resources to sustain their livelihoods even though the wetlands are drying up. Therefore, the respondent's educational background was investigated to assess their level of education and their understanding in the field of resource management and conservation. The results in table 4.2 show that 48% of the respondents have no formal education.

Table 4.2 shows the respondent's level of education

Level of Education	Number of respondents	Percentage %
Primary level and below	32	48%
Secondary level	27	40%
Tertial level	8	12%
Total	67	100%

Source: based on field survey (2019)

From the results obtained in Table 4.2 that illustrate that most of the people in this area have no formal education and do not have proper qualifications that can qualify them good-paying jobs and afford them a decent life. The researcher was interested in finding out how people from this area sustain their livelihood, where do they get their income from. Table 4.2 results show that most respondents rely on child support grants as their source of income.

Table 4.3 show respondent's source of income

Source of income	Number of participants	Percentage %
Child support grant	25	37%
Other	17	25%
Salary and Wages	14	21%
Pension grant	11	17%
Total	67	100%

Source: based on field survey (2019)

In relation to the above argument, that shows that 37% of the respondents depend on child social grant to sustain their livelihood, the researcher was interested in finding out who is responsible for taking care of the household. The results in table 4.4 show that most households in Mbazwana are child-headed, they mostly rely on their siblings to provide for the needs of the entire family.

Table 4.4 illustrates individuals responsible for sustaining the household within a family.

	Number of respondents	**Percentage %**
Siblings	22	33%
Parents	17	25%
Relatives	15	22%
Other	13	20%
Total	67	100%

Source: based on field survey (2019)

The above tables provide the socio-economic background of the study area. They give the examiner and the readers of this dissertation a clear picture of the kind of place Mbazwana location is and the conditions the people of this place are subjected to. In view of this, therefore, assessing the demography of Mbazwana community provided the researcher with the idea of where permaculture strategies should be implemented. In this study, permaculture strategies can promote sustainable agriculture and food security by educating women (72%) and children (37%) about the sustainable use of wetland resources and other forms of agricultural productivity that can be done outside the wetland ecosystem. This is because women and children use wetland resources more and are also responsible for providing for the needs of their households

4.2.1 Perspectives on community relations with natural resources

The perspectives of Mbazwana community members regarding their interaction with wetland resources are presented in this section. The researcher evaluated the interaction of Mbazwana people with wetland resources using structured, semi-structured, focus group interviews, questionnaires and field observation to collect data from the respondents. The researcher wanted to understand the

participant's views on how permaculture methods promote sustainable agriculture and food security in the Mbazwana location? Structured and focus group interviews were conducted with community members to investigate their relationship with wetland resources.

Table 4.5 Perspectives of Mbazwana community relationship with wetlands

Type of responses	Does your family farm?		Do you farm on wetlands?		Do you use any wetland resources?		Do you use wetland resources for your household benefit?		Do you sell wetland resources for income?	
	#	%	#	%	#	%	#	%	#	%
Yes	42	63	37	55	56	84	43	64	37	55
No	25	37	30	45	11	16	24	36	30	45
Total	67	100	67	100	67	100	67	100	67	100

= Number of respondents

% = Percentage

Source: Field-based material (2019)

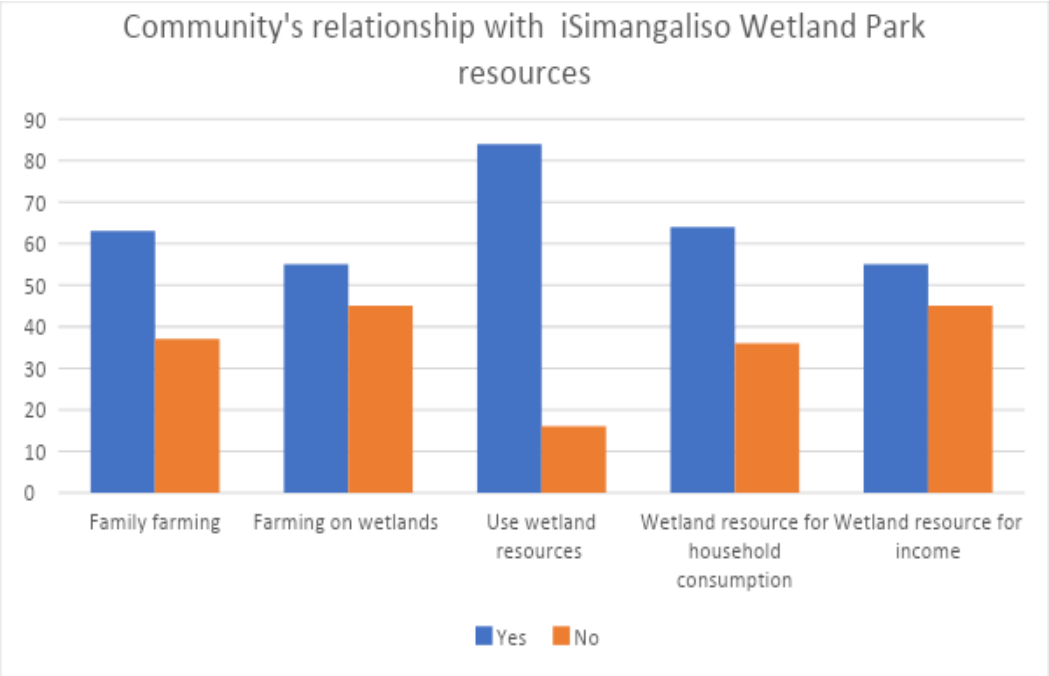

Figure 4.1: Graph showing the community's relationship with iSimangaliso Wetland Park resources

To assess the relationship of the community with wetland resources, respondents were asked whether they use wetland resources and what they are using these resources for. Out of all the research respondents who participated, 84% affirmed that they use wetland resources in the Mbazwana location. (63%) of respondents affirmed that they use wetland resources for farming due to its soil fertility and easy access to water. 45% of the respondents said they do not use wetland resources for farming, however, 64% of the respondents said they use wetland flora and fauna for sustaining their household food security. 55% of the total respondents said they use wetland resources such as reeds and other materials to make mats and handicraft sculptures that they sell for income (see table 4.3.1).

Field observation was also part of the research tools that the researcher used to collect data from the field, the researcher walked a mile in the shoes of the respondents, observing and participating in their daily life activities, while at the same time capturing and recording these events. The pictures below provide a

clear understanding of the relationship of Mbazwana people with iSimangaliso Wetland Park wetland resources.

Figure 4.2: illustrates cultivation on dried up wetlands, the image was taken by the researcher: August 2019

Figure 4.3: Commercial forest plantation on the wetland catchment area. Source: researcher, August 2019

Figure 4.4: Livestock grazing on wetlands. Source: researcher, August 2019

Figure 4.5: illustrates women carrying reeds from wetlands. Source: researcher, August 2019

Figure 4.6: illustrates women preparing wetland fertile soil for plantation. Source: researcher 2019

Figure 4.7: Illustrate fertile wetland soil prepared for plantation. Source: researcher, August 2019

In relation to the above picture, most participants perceive wetland resources as a source for food production due to their fertile soil and easy access to water. Mbazwana community members cultivate on wetlands during the dry season; they plant trees in the wetland catchment areas, and they use vegetation such as reeds from the wetland ecosystem as the material for building houses and mats. In view of this, therefore, permaculture promotes food security by encouraging individuals to use the nearest available resources to sustain their livelihoods.

4.3 Ecosystem adaptation methods that promote wetland conservation and restoration.

This section presents ecosystem adaptation methods that were suggested by participants during the interview process with the researcher. The research question that this study wanted to address in this section was what ways can permaculture promote wetland conservation and restoration in iSimangaliso Wetland Park. In view of this, therefore, one of the questions that the researcher asked sought to engage stakeholders ranging from governmental institutions to relevant non-governmental organizations to understand how permaculture and its methods can promote wetland conservation and restoration. Interviews and questionnaires were used to collect data from the respondents. In view of this, the key question that was asked was what methods can be used to ensure that wetlands are restored and conserved, while at the same time promoting food security? To answer this question, the key informant of this study stated that ecosystem adaptation methods are the methods that can be used to reduce the pressure of wetland resource consumption by promoting wetland conservation while providing alternative means of sustaining people's livelihoods.

To add from the above response, a government official stated that "*our department is planning on using Expanded Works Programs (EPWP) to restore these wetlands. The department will use this opportunity to work together with the community and at the same time create job opportunities for them. In this way,*

the wetlands will be restored, and the community members will have jobs and be able to put food on their table without relying on wetland resources for survival".

Other respondents were of the view that there is a need to support and promote community-based tourism opportunities so that local people can also benefit and earn money by selling their goods to the tourists.

"*Umhlabuyalingana is blessed with iSimangaliso Wetland Park which attracts tourists from different walks of life, interested in learning about the beauty of our culture and buying things that are originally made by local people. In this regard, local people's livelihood will be sustained by the money they get from selling their objects to tourists and nature will be conserved for its aesthetic value*".

Most non-governmental organizations were of the view that the government and donors need to support co-develop and small business development. They argued that this can be done by providing training centers that will equip local people with skills that will allow them to start their own businesses and be able to sustain their livelihoods without relying on wetland resources.

Figure 4.8: Showing craftwork that local people make and sell to tourists. Source: researcher, August 2019

Figure 4.9: Embroidery work that is done by local women to sell on the market for them to sustain their livelihoods. Source: researcher, August 2019

Investing in projects like craftwork and embroidery work done by local people does not only contribute in meeting the present needs of the local people, but it provides poor local people with skills that can be useful in sustaining their livelihood for a very long time, using resources that are found outside the wetland ecosystem.

Environmental awareness and education were another ecosystem adaptation method mentioned by community developers that the researcher engaged with. The young lady the researcher was interviewing said ''*There is a pressing need to educate local people about the impacts of destroying the wetlands to the environment and to their livelihood*".

When the researcher was interviewing community members and asking them about the impacts of destroying the wetlands, amongst others these were the responses the researcher obtained from the respondents ''*The wetlands have sustained us for decades when we faced drought seasons and they recovered well during the rainy season*. *That is how nature operates, it repairs itself after sustaining its people*". The other old lady said "*the wetlands have been there*

before we were born, they sustained our forefathers. They are given to us by our ancestors to turn to in times of need"

This clearly shows that local people are not aware of the dangers they impose on the wetland ecosystem and because of this they cannot be held accountable for their ill actions until the awareness is conducted to the area informing them about how things have changed through time and the impact of continuing to mistreat wetlands.

The removal of alien tree plantations was stated as one of the ecosystem adaptation methods that can promote wetland conservation. One of the relevant government department officials stated that their department is working together with the local governing bodies and iSimangaliso Wetland Park officials to ensure that the wetlands are restored. These stakeholders are working on removing timber, gum and pine trees that are believed to consume more groundwater and replace them with Macadamia groundnut that they argued that they will have minimum impact on the wetland ecosystem and will also be used as an economic injection to the municipality.

In view of the above consideration, permaculture promotes wetland conservation and restoration in iSimangaliso Wetland Park by using ecosystem adaptation methods like Expanded Work Programs (EWP); promotion of tourism opportunities; small business developments; training and skills development; education and awareness; removal of alien forest plantation and replacing it with groundnuts plantation to reduce pressure on wetland resources. These methods reduce consumption pressure on wetland resources while at the same time provide for the needs of the community by providing them with livelihood assets found outside the wetland ecosystem.

4.4 Methods that integrate wetland conservation and agriculture productivity

The main question that this study wanted to address revolves around ways in which permaculture can align iSimangaliso Wetland Park conservation with agricultural productivity at Umhlabuyalingana. The semi-structured interview and focus group interviews were used by the researcher to obtain data from the respondents. The researcher engaged with the relevant governing bodies, community members and non-governmental organizations to acquire their contribution towards ensuring that wetland and agriculture have a harmonious relationship.

One of the Non-governmental organization members stated that "*our organization works together with donors to supply clean drinking water to the neediest families identified by local people. The we provide tanks to these families so that they can harvest rainwater during the rainy season and use it during drought. There is also a water pump that is made available for the community to get water from during drought. This water pump is pumping water that is stored in the underground water reservoir that never went dry ever since it was installed. This pump also reduces the pressure of community reliance on wetland water*".

Figure 4.10: Water harvest tank donated to a needy family. Source: researcher, August 2019

Figure 4.11: Water pump. Source: researcher, August 2019

The researcher engaged with a group of community members and NGOs using focus group interviews. The key question that the researcher asked was what the role of community and NGOs in is reducing pressure on wetland resources. The community members stated that "*we contribute to the pressure reduction of wetland resource consumption by having a gardening project that provides us with enough food necessary to sustain our livelihoods*. We work together with NGOs to ensure that water, crops, and everything that is needed to keep these projects operating is available".

The members of NGOs said, "our organizations supply water pumps and water harvesting tanks to community projects for irrigation". The community sells these crops during harvest season for income and sometimes they distribute a certain portion amongst themselves for their food security.

Figure 4.12: Community garden project. Source: Field surveyor, August 2019

4.5 Conclusion

The aim of this chapter was to present the findings that address the research questions of this study. The main question that this study wanted to address was, what ways can permaculture methods integrate wetland conservation and agriculture productivity in Umhlabuyalingana. In view of this, therefore, the results of this study reveal that wetland conservation and agricultural productivity can be integrated by providing water harvesting tanks and water pumps to community members so that they won't have to go to wetlands for water during the dry season. Also, the promotion of community upliftment projects that encourages people to plant crops at their own gardens and at their respective community projects and do craftwork to sustain their livelihood using resources outside the wetland ecosystem, reduces pressure from wetland resource consumption. Consequently, the wetland ecosystem will be conserved, and livelihoods will be sustained by agricultural productivity and other livelihood assets that are obtained outside wetland resources. This shows that permaculture strategies used in this study correspond with basic permaculture principles that

aim at taking care of the people, care for the environment and distribute the fair share of resources among the individuals in the community.

CHAPTER FIVE

ANALYSIS AND DISCUSSION

5.1 Introduction

This chapter is dedicated to discussing and analysing the research findings of this study. This will be done by analysing empirical evidence presented in chapter 4 in relation to the existing literature reviewed by the researcher. These findings will be compared and contrasted with prior knowledge of this study literature to get a holistic interpretation of how permaculture promotes sustainable livelihoods and ecological conservation in iSimangaliso Wetland Park, KwaZulu-Natal. This chapter is based on addressing the aim and objectives of this research stated in section 1.4. In view of this, therefore, this chapter begins by discussing the role of permaculture in promoting food security in Mbazwana Location, followed by analysing the role of permaculture in promoting wetland conservation. Lastly, the role of permaculture in aligning wetland conservation with agricultural productivity is also analysed in this chapter.

5.2 The role of permaculture in promoting food security in Mbazwana location

The role of permaculture methods in promoting sustainable agriculture and food security was one of the objectives investigated in this study. Different questions were asked to investigate the participant's relationship with iSimangaliso Wetland Park resources during the data collection phase (see section 4.3).

One of the key findings that were discovered in this study was that iSimangaliso Wetland Park wetlands are predominantly used by women for agriculture purposes. This is because women have the responsibility of nurturing the household in terms of ensuring there is enough basic needs such as food, water etc to sustain their households. Women are also responsible for preparing food for their families, which qualifies them for knowing the type and season suitable for

specific vegetable plantation and harvesting; and this also provides them with better knowledge of places with fertile soil and easy access to water for irrigation. These women are mostly involved in small scale farming of vegetables and other food crops that are mostly consumed at the household level (see figure 4.3.4; 4.3.5). Therefore, it is evident that women play an important role in sustaining their family's livelihood in Mbazwana location. According to the World Health Organization (2000) women play an important role in implementing a healthy nutrition policy, at a household level and in society at large. The World Health Organization (2000) further highlights that women's role of nurturing the family starts from breastfeeding the new-born baby to preparing meals for the whole family, to being employed in food manufacturing and public catering industries. It is evident that the pattern observed in the Mbazwana location is related to the behavior of women all around the world.

In view of this, therefore, it is important that local government and relevant stakeholders start to pay more attention to the role that women play in food production and also assess their knowledge in natural resource consumption and utilization. There is a need for relevant stakeholders to provide women with smart food production strategies that they can adopt that promote sustainable use of natural resources while meeting the needs of the present generation and conserving other resources for future generations.

In this particular study, the level of education was investigated to assess women's understanding and expertise in the field of resource management and conservation. The findings presented in table 4.1 show that 48% of wetland users have no formal education. Anderson (2006) is of the view that the lack of knowledge is the driver of biodiversity loss and environmental degradation in a poor society. This is because those who lack knowledge in the poor community perceive natural resources to be infinite because these resources are widely dispersed, renewable, and are often found in common property areas where poor people can access them without owning the land. This type of behaviour is observed in iSimangaliso Wetland Park where poor Mbazwana community

members are still solely dependent on wetland resources to sustain their livelihoods even though the wetlands are currently drying out.

For this reason, therefore, there is a pressing need to educate and empower Mbazwana community members, especially women with different agriculture practices to reduce the pressure of their daily activities on the wetland ecosystem. This view is also supported by Vodouhe et al. (2010) who argue that there must be a bottom-up approach when it comes to resource management which allows local people to be an integral part of conservation efforts, otherwise the environmental conservation and protection efforts are doomed without community involvement. Akhtar et al. (2014) state that the community conservation approach accommodates local people's needs and aspirations by empowering and promoting their active participation in local resource management and improving their economic welfare. MacManus (2010) also puts an emphasis on the importance of educating people about natural resource management by arguing that it reduces society's reliance on industrial systems of production through educating society about resources that are argued to be deteriorating the environment.

The findings of this study that shows that Mbazwana residents do not have formal education and are solely dependent upon wetland resources to sustain their livelihoods raised a concern on the researcher regarding these community members' source of income. The findings show that 37% of the respondents rely on child support grants as their monthly income that is used to sustain the whole family. In view of this, therefore, the researcher was interested in finding out who is responsible for sustaining these poor people's households since the majority of the respondent's do not have proper qualifications that can afford them good-paying jobs and mostly rely on government support grants and natural resources to survive. The results show that most households (33%) in Mbazwana are child-headed, they only have their siblings to support them and this is the reason why they only have child support grants as their main source of income.

According to the 2019 KwaZulu-Natal business report the Umhlabuyalingana municipality is very poor and experiences challenges in delivering services to the community in a short period of time. The continuous influx of migrants from Mozambique and Swaziland coming to search for better lives in South Africa contributes a lot in high population growth and shortage of service delivery in that area resulting in poor infrastructure and shortage of jobs, housing, etc. Consequently, the parents and matured people from this area also migrated to the nearest towns in search of a better life and leave their children at home under the supervision of the senior citizen or elderly siblings (see table 4.4).

People that left their homes in search of a better life face many challenges that lead them to decide not to go back home anymore. These challenges include a high rate of unemployment, exposure to harsh environments that drove them to alcohol, substance abuse, and diseases. Therefore, these people end up not coming back home since they see themselves as failures and cannot take their families out of poverty as they promised and, in most cases, they come home dead, leaving their children behind. Children from child-headed households lack food security; they go for consecutive days without food in their homestead and those that are fortunate to attend school, get their only meals for the day at school through the feeding scheme (Thwala, 2018).

According to Pillay (2016), children from child-headed households are also at risk of having to cope without parental care or regular stable income and in most cases, they are located in areas where services are poor. Children from child-headed households are a more vulnerable group of children. They are likely to be victims of abuse and exploitation and they also have to deal with the responsibility of having to provide for the needs of their younger siblings. The pressure of having to put food on the table without income leads these children to look for the next available resources that can sustain their livelihood without having to use money. In this case, wetland resources serve as a solution to poor households, as they are easily accessible and have fauna and flora that can sustain poor livelihoods without spending money.

Figure 4.8 to 4.12 of this study showed that permaculture promotes sustainable livelihoods by rebuilding a society and managing the distribution of resources necessary for living to individuals in the community. Permaculture restores society by giving back control of resources necessary for living such as food, water, shelter, energy and the means of livelihood to ordinary people in the community. This is because permaculture is a system that is designed to work with nature in a way that sustainable agricultural systems and human habitats imitate the relationships and patterns found in natural ecologies (MacManus, 2010).

This study focused on unpacking the relationship of Mbazwana people with iSimangaliso Wetland Park resources. The research findings illustrate that the respondents had in one way or another a relationship with iSimangaliso Wetland Park wetland resources. It was discovered that 63% of the respondents have agriculture as their main source of household sustenance (see Table 4.3.1). During the drought season, the community members look for fertile soil and water accessible places to plant their crops, in this instance, wetlands are the perfect fit for the community's needs (see figure 4.3.1; 4.3.5; and 4.3.6). According to World Wetland Day (2014) wetlands have supported agriculture for many years, providing fertile soils, and constantly supplying water to support agricultural production. This is due to the fact that wetlands are good pollinators of crops; providing frost protection and are also predators of crop pests (Gerakis and Kalburtji, 1998). Wetlands also act as a key resource for pastoralists and cultivators in Savanna Africa during drought or dry season, by providing grazing and arable land for agriculture (Scoones, 1991). This shows that the wetlands ecosystem has the ability to support agriculture productivity, thereby, contributing to poverty reduction.

KwaZulu-Natal has high temperatures which lead to a high evaporation rate in the dry season. Slash and burn are a common practice in Mbazwana location increasing the heatwave and worsening the dryness of that area. Consequently, the community uses wetlands as their next available water resources for their everyday activities. However, Holmgren (2003) is of the view that permaculture

supports the concept of plants and natural resources used by humans as a source of sustainable energy. Bemmel et al. (2017) argue that the ability of permaculture to provide the values that are in growing demand makes it suitable for responding to future developments while meeting the needs of poor people.

Formal and informal forest plantation was declared as a major economic activity in Umhlabuyalingana. According to World Wetland Day (2014) agriculture in developing countries is the main driver of economic growth and sustains most poor rural households through the provisions of different livelihoods and income generation activities. However, the trees that are planted in Umhlabuyalingana are alien trees that contribute a lot to groundwater decline because they use more water compared to indigenous plantations (see figure 4.3.2). Forest plantation is not the only activity taking place at iSimangaliso Wetland Park wetlands. 64% of the respondents stated that they use wetland resources to sustain their household food security (see Table 4.3.1). The community members use wetlands for subsistence farming, livestock grazing, fetch water, fishing, etc. Anderson (2006) supports this pattern of agriculture that sustains poor households by stating that an estimated 2.5 billion rural households in the world rely on agriculture, hunting, fishing and forestry for their livelihoods, meaning what is happening in Umhlabuyalingana is not new.

To conclude on this section, permaculture promotes sustainable agriculture and food security by allowing the community to use the available resources to produce food that will sustain their livelihood. This is evident in the use of the wetland's ecosystem in the Mbazwana community during the dry season as the community was looking for the resources that can meet their seasonal needs. The iSimangaliso Wetland Park wetlands have fertile soil that allows the community to plant their vegetation and there is easy access to wetland water for irrigation. The findings of this study show that this community uses wetland resources like reeds as the material to make mats that the community members sell to tourists, and they use fish found in the wetlands to feed their families. Community members fetch water for their domestic needs from the wetlands during the dry season.

Farmers also use wetlands for livestock grazing because wetland has the resources necessary to sustain livestock during drought, for example, the fresh grass and water for livestock to drink and eat (see figure4.3.3).

According to Akhtar et al. (2014), basic permaculture principles encourage people to begin where they are and use what they have to sustain their livelihood. This is evident in the relationship observed between community members of Mbazwana location and iSimangaliso Wetland Park wetland resources when community members were facing drought. Mbazwana people started to look for means to sustain their livelihood and wetland resources were what they had as a coping mechanism. Holmgren (2007) supports this by stating that permaculture is utilized as a motivation to make firmly interlocking networks of plants and animals that suit human wants. In the event that things develop and change, the role of permaculture is to make a solid match for the community settings by allowing diversity and adaptation.

5.3 The role of permaculture in promoting wetland conservation in iSimangaliso Wetland Park

Investigating the ways in which permaculture and its methods can promote wetland conservation in iSimangaliso Wetland Park is one of the objectives that this study wanted to address. Figure 4.2 to figure 4.7 revealed that agricultural activities on iSimangaliso Wetland Park wetlands caused deterioration and a total drying out of wetlands. As such, the researcher engaged with the Department of Agriculture, Forestry, and Fisheries in Umhlabuyalingana municipality, iSimangaliso Wetland Park management and community leaders and investigated ways in which permaculture can promote wetland conservation in iSimangaliso Wetland Park. The findings of this study revealed that the ecosystem adaptation methods are permaculture strategies that promote conservation and restoration of wetlands (see section 4.4). This section discusses existing literature in relation to ecosystem adaptation methods discussed by the researcher and relevant stakeholders.

This study discovered that ecosystem adaptation methods such investing in community upliftment projects, water harvest methods and the removal of alien plantation can reduce the consumption pressure on wetland resources in iSimangaliso Wetland Park by rehabilitating and restoring the wetland ecosystem while providing alternative measures for those individuals that were solely dependent on wetland resources as their source of food security. Ecosystem adaptation methods are adopted from permaculture strategies that aim at taking care of the needs of the people and also taking into consideration the well-being of the environment. Permaculture seeks to empower communities to rely more on themselves and, in the process, to calm the social injustice and ecological degradation made by the worldwide political economy (Veteto and Lockyer, 2008). This was done by providing skill and resources such as the embroidery work (see figure 4.9), craftwork (see figure 4.8) skills and material to community members to use in order to provide for their household needs.

According to Bulut and Yilmaz (2008) permaculture is a system that integrates ecology and human life; organic growth and landscape by focusing on sustainability and productivity. This is because permaculture is designed based on ethical rules that are related to land use, food production, and social needs. MacManus (2010) argues that permaculture encourages people to create their own environment and construct self-sustaining human settlements. This aims at solving problems internally by redesigning the harmful systems to become naturally regenerative.

The Department of Agriculture, Forestry and Fisheries working together with the community are making efforts in rehabilitating and restoring iSimangaliso Wetland Park wetlands. The government uses this ecosystem adaptation method as a means of developing the community in terms of job creation and wetland conservation. The community is developed through the provision of skills and knowledge regarding wetland resource management and rehabilitation by government and local authorities. These skills and knowledge qualify community members to be employed by the government to restore and rehabilitate wetland

ecosystems. This ecosystem adaptation method provides for the needs of society and conserves the natural environment.

ISimangaliso Wetland Park is the country's largest natural freshwater wetlands. For this reason, iSimangaliso Wetland Park attacks tourists from all over the world, thereby contributing to the Umhlabuyalingana municipality economy. Apart from iSimangaliso Wetland Park, Umhlabuyalingana municipality is also rich in natural assets and heritage sites that include Ndumo Game Reserve, Sodwana bay, and Tembe Elephant Park. Thus, the promotion of tourism opportunity is stated as another method that can reduce the consumption pressure on wetland resources (see figure 4.4.1.).

Tourists visit Umhlabuyalingana wanting to experience the beauty of its natural environment, the culture, and heritage of its people. The method of promoting and investing in indigenous food, clothing, and craftwork specifically made by local people is very important as it forms part of tourist attraction and contributes more to the local economy (see figure 4.8 and 4.9). This method does not only contribute to the local economy but also contributes to the conservation of natural assets in order to maintain their aesthetic beauty. Consequently, economic, social and aesthetic needs are managed and fulfilled while cultural integrity and ecological processes are maintained. According to Querini (2003) tourism includes optimum use of resources such as biological diversity while minimizing ecological, cultural and social impacts in a way that maximizes the benefit of conservation for local communities. The World Tourism Organization (2000) states that tourism is regarded as sustainable when it leads to management of all resources in such a way that economic, social and aesthetic needs can be fulfilled while maintaining cultural integrity, essential ecological processes, biological diversity, and life support systems.

The promotion of education and awareness is another ecosystem adaptation method that is adopted in this study to educate the local community about the changing environment they are living in. Anderson (2006) argues that lack of knowledge is the driver of environmental degradation and biodiversity loss in poor

society. This is evident in the relationship between Mbazwana community and iSimangaliso Wetland Park resources. This study found that the Mbazwana community has little knowledge regarding sustainable use and management of wetland resources and they do not understand the dynamics around working in vulnerable ecosystems. The lack of knowledge leads to the poor community perceiving natural resources as infinite because these resources are widely dispersed, renewable, and are often found in common property areas where poor people can access them without owning the land.

For these reasons, therefore, it is important to conduct awareness where poor people can be educated about the sustainable use and management of resources; and the environmental changes that led to the ecosystem's vulnerability. According to World Wetland Day (2014) in our present-day lives, wetlands are under pressure of climatic conditions, population growth, and many other issues. The global warming and climate change that the world is currently facing contributes the most to the damage of land and water ecosystems and loss of production potential. These environmental changes trigger depletion in soil fertility, degradation of forest resources, water resources, pastures, and fisheries (carney, 2001; Fischer et al., 2002). UNEP (2006) is of the view that this reveals that there is a pressing need for awareness to educate local people about the impact of destroying the wetlands to the environment and to their livelihood. Thus, awareness and education were started as another ecosystem adaptation method in this study.

The removal of alien forest plantation and replacing it with groundnut plantation is another method the Department of Agriculture, Forestry and Fisheries partnered with the local governing bodies and iSimangaliso Wetland Park management adopted to ensure that the wetland ecosystem is restored. The relevant stakeholders are removing timber tree, gum tree, and pine tree plantation and replacing it with Macadamia groundnut plantation. These alien trees are planted at the iSimangaliso Wetland Park wetland catchment area. According to CapeNature, alien trees are trees that are from other countries and when they are brought in South Africa, they cause either human, environmental or

economic harm. Alien trees produce and spread rapidly compared to indigenous plants, thereby, taking more space and consuming more water and accelerating drought. These relevant stakeholders are using this ecosystem adaptation method to rehabilitate the damage made by these alien trees on the iSimangaliso Wetland Park wetland ecosystem and at the same time use macadamia groundnut as a remedial action that will have minimum impact on the wetland ecosystem and will also be used as an economic injection method to the municipality economy.

Permaculture principles have a positive plan logic that perceives that the harm done to the earth's natural environment can be repaired. This is evident from the ecosystem adaptation method of replacing alien trees that consume more water with macadamia ground nuts to repair and restore the wetland ecosystem. According to Abrahams et al. (2017), permaculture design principles are used to develop strategies that are concerned about worldwide changes in the atmosphere and local climate designs, biodiversity loss, and future constraints of energy decrease. Bemmel et al (2017) are of the view that activities on permaculture farms are not only related to food production but also to nature restoration and management, social involvement, knowledge creation and sharing as well as the local economy and community building.

Permaculture adopts the keystone species approach to encourage people to conserve and repair the damage they caused in the natural environment. According to Garibaldi and Turner (2004), the Keystone species play a role in the general structure and workings of the ecosystem. Keystone species in human society all around the world have a significant value attached to it that shapes the relevant underpinnings of the culture of humans. These plants and animals play a crucial role in people's eating regimen, material, or in medicine. These keystone species can be referred to as cultural icons when they influence people's language, ceremonies and the way they live their lives.

Cultural keystone species are utilized and harvested in substantial amounts and intensively managed for quality and productivity. Given that biological

conservation and ecological restoration represent human culture as significant parts, a method that may enhance achievement in general conservation or restoration endeavours is to perceive and focus around cultural keystone species. In view of this, therefore, the keystone species approach can be adopted to conserve and restore iSimangaliso Wetland Park wetlands by educating people about the values of wetland resources in their everyday lives. And also encourage active participation of local people in keystone species conservation and resource management while improving their economic welfare by wetland resources. Consequently, it is said that if people find a value that is strongly attached to their beliefs from the wetland's ecosystem, their attitude and behaviour towards resource consumption changes as well. People tend to care and protect what they feel to add value to their livelihood.

5.4 The role of permaculture in aligning wetland conservation with agricultural productivity

The key objective of this study was to investigate ways in which permaculture aligns wetland conservation with agricultural productivity. Research findings together with the existing literature discovered that there was an urgent need to look at the ways in which iSimangaliso Wetland Park can be conserved and at the same time, the need for agricultural productivity to sustain livelihood needed to be taken into consideration as well. The results from this study found permaculture to be an agricultural approach that aligns wetland conservation and agricultural productivity in a way that the two can have a harmonious relationship.

Permaculture is an ethical design philosophy that promotes a holistic approach to agriculture in particular, and to the human culture as a whole, strengthening and embracing the farm-ecosystem while generating healthy agricultural outputs as well as social and ecological benefits (Bemmel et al., (2017). Permaculture activists advocate for ethical and holistic permaculture strategies that do not pollute the land, products or surrounding water sources, but strengthen them and require a low input farming system (Bemmel et al., 2017; Holmgren, 2007). These

permaculture strategies improve beneficial soil life, soil fertility, and water retention capacity by encouraging the creation of the permanent cover of productive photosynthetic activity that protects the soil. This allows the permanent vegetation below and above the ground to store carbon in its biomass in order to create the diversity that will lead to the system's resilience. The organic crops produced from this method can be harvested throughout the season, while genetic diversity is protected (Bemmel., 2007).

This study discovered a water harvest method as one of the permaculture strategies that can promote agricultural productivity by providing clean drinkable water for domestic purposes and vegetation crops irrigation to the community while at the same time promoting wetland conservation by ensuring that the wetland resources are left to recover (see section 4.5). Rainwater harvesting is the process of collecting rainwater from the roofs of the buildings, in most cases and storing it in large containers such as tanks for later use. Water harvest tanks were provided to the poor community members of Mbazwana location by NGOs as a tool to use to harvest rainwater during the rainy season and use it during drought (see figure 4.5.1). This water harvest tool was not only provided to the poor families in Mbazwana location but was also provided to the different gardening projects sites in the community that needed water to grow their vegetable crops. Rainwater harvesting method is a good strategy for providing for the needs of the community while at the same time decreasing the pressure of wetland water usage. This method also promotes the conservation of water and reduces free-flowing rainwater that might lead to flooding and soil erosion.

Another tool that was made available to the community of Mbazwana location by the NGOs is a water pump (see figure 4.5.2). The water pump is a water harvesting tool that stores water in the underground reservoir and supplies it to the community in times of need. This water harvest tool contributes to the reduction of the community's reliance on wetlands water while supplying them with clean running water for their daily needs. NGOs seem to be contributing a lot in promoting sustainable livelihoods of poor communities and they are also part of

the individuals encouraging sustainable resource management. This is evident in the part they play in distributing water harvest tools to the poor Mbazwana community and the efforts they make in conserving and restoring iSimangaliso Wetland Park wetlands. According to Dharigouda et al. (2017), NGOs are a group of motivated people that play an important role in redressing various social and environmental issues for the benefit of the poor.

Apart from water harvest methods, community upliftment projects have been discovered to be another method that can help in decreasing pressure from wetlands resource reliance by encouraging people to make their own food (see figure 4.5.3). This initiative encourages community members to work together in producing different vegetables depending on the season, for their personal consumption and sometimes to sell these crops for income. Non-governmental organizations work closely with the community and sponsor these projects with water pumps and water harvesting tanks for irrigation to ensure all the project's needs are taken care of.

Permaculture initiatives promote the working together of different stakeholders where knowledge is shared. Permaculture farmers are encouraged to take part in programs involving the exploration of opportunities in the form of taking courses, engaging with relevant government institutions and attending educational farm tours in searching for a better understanding of the environment they are working on (Bemmel et al. (2007). The above Mbazwana location initiative is an example that demonstrates 'fair share' which is one of the basic permaculture principles. The community members and NGOs are sharing knowledge of how to effectively manage the resources they have to benefit them and the environment while at the same time provide enough necessities to sustain both the environment and human needs while expanding the economy for future generations.

5.5. Conclusion

The main objective of this study was to investigate how permaculture methods can be used as tools that promote sustainable livelihoods and wetland conservation in iSimangaliso Wetland Park in Umhlabuyalingana, KwaZulu-Natal. The research findings of this study reveal that permaculture strategies such as water harvesting and storage, efficient water system strategies, and the promotion of the use of drought-tolerant crops and the diversity of farming are the permaculture tools that lessen agriculture reliance on wetland ecosystem by providing alternative resources that sustain people's livelihood outside wetland ecosystem.

In Mbazwana location this was done by different stakeholders working together to provide water harvesting tools such as water harvest tanks and water pumps to the community members so that they won't need wetland water during the dry season. These stakeholders also encouraged the community to plant vegetable crops at their own garden by providing them with crops that sustain their life without relying on wetland resources for survival. Thus, wetland resources will be conserved and restored while local people's livelihood will be sustained by resources not found in the wetland ecosystem.

According to MacManus (2010), permaculture is found to be suitable for addressing problems like those found in Mbazwana location that include changing and unfriendly environment; sustainability and water deficiencies; the quick consumption of non-renewable resources and the destruction of the ecosystem that keep up the balance in the environment, because permaculture is an agricultural approach that promotes sustainable livelihoods by rebuilding a society and managing resources necessary to sustain people's lives and provide basic needs like water, food, shelter, and working environment, to common individuals in the communities (Barrette (2011).

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

This chapter provides a summary of the main findings of this study. This chapter starts by putting forward the main themes that form the basis for this study. The recommendations of how permaculture can effectively promote sustainable livelihood and ecological conservation are stated to pave a way for further investigation by the upcoming researchers.

6.2 Summary of the research findings

This study examined the role of permaculture principles and its strategies in promoting sustainable livelihoods and ecological conservation in iSimangaliso Wetland Park, KwaZulu-Natal. Most literature reviewed for this research reveals that permaculture is an agricultural approach that is broad-based as it cares not only for the well-fair of communities and their needs, but it also takes into consideration the well-being of the environment and the ecosystem. Permaculture adopts sustainable principles that ensure the needs of the presences are met without compromising the ability of future generations to obtain their needs. The observations of the researcher confirmed that the methods of permaculture employed in Umhlabuyalingana do reduce the pressure in natural resource consumption and allow the natural environment to restore itself and at the same time, it ensures the needs of the people are taken care of, as permaculture principles state that permaculture care for people, care for the environment and also care for the distribution of resource surplus in order to sustain livelihoods.

This study revealed that permaculture promotes sustainable livelihoods by rebuilding a society and managing the distribution of resources necessary to sustain people's lives by providing basic needs like water, food, shelter and working environment, to common individuals in the communities. Permaculture

recreates a world without destruction and pollution by encouraging people to take responsibility for their actions and change the behaviours of consumption and exploitation of natural resources. The research findings show that permaculture principles that allow people to start where they are and use what they have to sustain their livelihood were implemented in Mbazwana location. The community members used wetland resources as what they have to sustain their livelihood during the dry season. The community members used iSimangaliso Wetland Park wetlands for farming, fishing, farm herd livestock, fetch water as a coping mechanism to sustain their households during drought because the soil found in wetlands is fertile and there is easy access to water and other resources they need to survive.

Non-governmental organizations collaborating with government officials highlighted different permaculture methods that they believe reduces the pressure of high consumption of wetland resources, and at the same time caters to the needs of the community. The findings of this study stated that these permaculture methods include Expanded Work Programs (EWP) to rehabilitate and restore wetland resources; promotion of tourism opportunity, investing in small business development; training and skill development; education and awareness; and removal of alien forest plantation and replacing it with groundnut plantation. These permaculture methods reduce the reliance of community members on wetland resources by diversifying methods of obtaining means of sustaining people's livelihoods while allowing wetlands to recover and restore itself.

The research observation and existing literature revealed that the iSimangaliso Wetland Park wetlands are drying out quickly due to the agricultural activities taking place on those wetlands and the reliance of community members on fauna and flora found at these wetlands to sustain their livelihoods. Permaculture principles were discovered to have methods that can align the wetland conservation and agriculture productivity in a way that the two can complement each other. Water harvest methods were one of the methods implemented,

whereby community members were given water harvest tanks and water pumps to get clean drinkable water without having to go to wetlands for water.

Community upliftment projects method seemed to be a good strategy in ensuring that livelihoods are met using resources outside the wetland ecosystem. This initiative provided community members with the necessary resources required to plant vegetable crops at their gardens or at their respective project sites for them to sustain their households. It can be concluded that permaculture and its methods promote the restoration and conservation of iSimangaliso wetlands because they reduce pressure from wetland resource consumption and provide necessary resources for Mbazwana people to continue producing food away from the wetland ecosystem. In this way, wetlands are conserved and restored, and agricultural activities continue to sustain people's livelihood.

6.3 Recommendation

Based on the above findings and discussions, it clearly shows that permaculture principles have strategies that ensure that wetlands are conserved, and the needs of the community are catered for. However, there is a need to improve in the distribution of resources, taking into consideration the population growth and socio-economic challenges that are worsened by the continuous influx of migrants from Swaziland and Mozambique. There is a need for the government to tighten security on the borders of this country to avoid illegal migration. The improvement of infrastructure is another issue that needs to be looked at by the Umhlabuyalingana municipality. Proper infrastructure attracts business investors and later contributes to municipality economic injection.

Local authorities need to put their differences and politics aside and work together for the benefit of the people. The researcher found out that there is a division in the chieftaincy at Umhlabuyalingana which made it difficult even for the researcher to get permission for conducting the study. The chiefs in that area are fighting over land allocation and ownership. This conflict delays service delivery because no one wants to take accountability for neglecting the

community. This affects the community the most because the developments take time to be approved by these leaders.

Resource management awareness needs to be conducted in this area. Educating people about the value of the resources they have to their lives is very important. Some people are not even aware of the socio-economic and environmental impact of their actions on the wetland ecosystem because they argue that they have been sustained by wetland resources for years with wetlands recovered well during the wet season.

Recommendations for further research would be to explore challenges that hinder the effectiveness of permaculture principles in promoting sustainable livelihood and ecological conservation. The current study focused more on the role of permaculture methods in promoting sustainable livelihood and ecological conservation whilst a closer look at the challenges that hinder the effectiveness of this method can provide a better understanding of the factors affecting the successful implementation of this strategy.

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APPENDIX 1

1. Questionnaire for community members of Mbazwana Location

This is academic research on the role of permaculture in promoting sustainable livelihoods of the Mbazwana Location and ecological conservation of iSimangaliso Wetland Park in Umhlabuyalingana, Kwa-Zulu Natal.

Instructions: Please put (X) inside the box of the appropriate answer.

1. Gender

Female ☐

Male ☐

2. What is your educational background?

Primary level ☐

Secondary level ☐

Tertiary level ☐

3. Who is responsible for sustaining this household?

Parents ☐

Relatives ☐

Siblings ☐

Other, ☐ please specify

……

4. What is your form of income?

Salary and wages ☐

Pension grant ☐

Child support grant ☐

Other, ☐ please specify

……

5. Where does this family get food from?

Farming ☐

Commercial shops ☐

other, ☐ please specify

……

6. If your answer in question 5 is farming, what are you farming?

……

7. How often do you visit iSimangaliso Wetland Park? And what activities do you normally do when visiting the wetland?

Get domestic water ☐

Farming ☐

Farm herding livestoc ☐

other ☐ please specify

……

8. If your answer in question 7 is farming. What do you do with your crops?

Sell them for income ☐

Use them for the personal benefit ☐

other, ☐ please specify

……

9. Are there any changes you observed in the wetland catchment or wetland itself, after the introduction of agriculture in the wetland catchment? If yes, what are they?

Deforestation ☐

Land alteration ☐

Decrease in water volume ☐

other, ☐ please specify

……

10. Is there anything you would like to share with us?

……

Thank you for answering this questionnaire. You are assured that all information will be treated with confidentiality.

APPENDIX 2.

Interview guide for: iSimangaliso Wetland Park management and employees, community headman and his cabinet, and the municipality management and employees.

This is academic research on the role of permaculture in promoting sustainable livelihoods of the Mbazwana Location and ecological conservation of iSimangaliso Wetland Park in Umhlabuyalingana, Kwa-Zulu Natal.

1. Who are the main stakeholders responsible for the management of iSimangaliso Wetland Park? And what are their responsibilities?

2. Are these stakeholders delivering their main responsibility of protecting and conserving the wetland ecosystem?

3. Who are the main stakeholders responsible for agricultural productivity? And what are their responsibilities?

4. Are these stakeholders delivering their main responsibility of ensuring food security to people?

5. With cultivation and deforestation in the wetland's catchment area, how is the municipality or responsible stakeholders dealing with this situation, and what ways have been explored to ensure wetland conservation?

6. What strategies have been adopted to ensure that agricultural productivity is aligned with wetland conservation? Are these strategies working?

7. Beside agricultural and wetland provided resources, what are other alternative ways explored by the government to ensure food security to the community?

8. What are the challenges faced by the responsible stakeholder in ensuring a harmonious relationship between agricultural productivity and ecological conservation?

9. In your own opinion, what do you think can be done to integrate agricultural productivity and wetland conservation, and also promote food security to the community?

10. Is there anything you would like to share with us related to this topic?

Thank you for answering this questionnaire. You are assured that all information will be treated with confidentiality.

APPENDIX 3: ETHICAL CLEARANCE DOCUMENTS

Research Office

HUMAN RESEARCH ETHICAL COMMITTEE (NON-MEDICAL)

R14/49 Fixi

CLEARANCE CERTIFICATE PROTOCOL NUMBER: HI 8/09/04

PROJECT TITLE	The role of permaculture in promoting sustainable livelihoods and ecological conservation. A study of Isimangoliso Wetland Park in Kwa-Zulu Natal
INVESTIGATOR(S)	Ms A Fixi
SCHOOL/DEPARTMENT	GAES
DATE CONSIDERED	14 September 2018
DECISION OF THE COMMITTEE	Approved

EXPIRY DATE 24 October 2021

DATE 25 October 2018 CHAIRPERSON _____

(Professor J Knight)

cc: Supervisor: Professor M Simatele

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and ONE COPY returned to the Secretary at Room 10004, 10th Floor, Senate House, University. Unreported changes to the application may invalidate the clearance given by the HREC (Non-Medical)

I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and l/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved l/we undertake to resubmit the protocol to the Committee. I agree to completion of a yearly progress report.

_____ _____/_____/_____

Signature Date

PLEASE QUOTE THE PROTOCOL NUMBER ON ALL ENQUIRIES

UNIVERSITY OF THE
WITWATERSRAND,
JOHANNESBURG

Dear Sir/Madam

PARTICIPANTS INFORMATION SHEET FOR COMMUNITY MEMBERS OF MBAZWANA LOCATION

My name is Anela Fixi, I am a master's student in the School of Geography, Archaeology and Environmental Studies at the University of the Witwatersrand Johannesburg, South Africa. I am conducting a research topic entitled ***"The role of permaculture in promoting sustainable livelihoods and ecological conservation. A study of iSimangaliso Wetland Park in Umhlabuyalingana, Kwa-Zulu Natal."*** as part of my master's degree.

The purpose of this study is to investigate the role of permaculture in promoting sustainable livelihoods and ecological conservation in iSimangaliso Wetland Park in Umhlabuyalingana, KZN. This research will also identify ways in which permaculture can align agriculture productivity with wetland conservation.

I would like to invite you to participate in this research work, which investigates permaculture as a strategy that promotes food security. You have been invited to participate in this research because of your involvement and experience in the field of wetlands and agriculture. Before you decide, you need to understand why the research is being done and what it would involve for you. Please take the time to read the following information carefully.

If you agree to participate in this research, I will arrange a time to meet with you at your home or at an appropriate place. There will be one, single interview with myself during which I will ask you questions from the designed questionnaires. The interview is expected to last no longer than half an hour and is a one-off event. Your participation in this project is entirely voluntary; you are not obliged to take part. The research does not involve any payment of participants. If you do not wish to take part, you do not have to give a reason and you will not be contacted again.

Similarly, if you do agree to participate, you are free to withdraw at any time during the project if you change your mind. If you agree to take part, your name will not be recorded on the questionnaires and your information will not be disclosed to other parties. Your responses to the questions will be used for the purpose of this research work only. If you agree to participate in the interviews, our conversation will be recorded or written down and any information you share with me will remain confidential. The notes will be scanned and stored in a password protected computer while the questionnaires will be stored in a confidential official file before analysis. In the research report, I will use pseudonyms (false names) to conceal your identity and that of other participants.

The report from this study will be written as master's dissertation; it will also be presented at Geography seminars. It will also be made available online at the University of Witwatersrand library. When I have completed the study, I will produce a summary of the findings which I will be more than happy to send you if you are interested.

For any other information regarding this research project, please feel free to contact me, my supervisor or the ethics committee.

Kind regards

Ms. A. Fixi

Ms. Anela Fixi : 083 433 4513 or 1655534@students.wits.ac.za

Prof. Danny Simatele : 0117176515 or Danny.Simatele@wits.ac.za

Ms. Shaun Schoeman: 011 717 1408 or Shaun.Schoeman@wits.ac.za (ethics committee administrative officer)

UNIVERSITY OF THE
WITWATERSRAND,
JOHANNESBURG

Dear Sir/Madam

PARTICIPANTS INFORMATION SHEET FOR ISIMANGALISO WETLAND PARK MANAGEMENT AND EMPLOYEES, COMMUNITY HEADMAN AND HIS CABINET, AND MUNICIPALITY MANAGEMENT AND EMPLOYEES

My name is Anela Fixi, I am a master's student in the School of Geography, Archaeology and Environmental Studies at the University of the Witwatersrand Johannesburg, South Africa. I am conducting a research topic entitled ***"The role of permaculture in promoting sustainable livelihoods and ecological conservation. A study of iSimangaliso Wetland Park in Umhlabuyalingana, Kwa-Zulu Natal"*** as part of my master's degree.

The purpose of this study is to investigate the role of permaculture in promoting sustainable livelihoods and ecological conservation in iSimangaliso Wetland Park in Umhlabuyalingana, KZN. This research will also identify ways in which permaculture can align agriculture productivity with wetland conservation.

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why the research is being done and what it would involve for you. Please take the time to read the following information carefully.

If you agree to participate in this research, I will arrange a time to meet with you at your place of work or at an appropriate place. There will be one, single interview with myself during which I will ask you questions from the designed questionnaires. The interview is expected to last no longer than half an hour and is a one-off event. Your participation in this project is entirely voluntary; you are not obliged to take part. The research does not involve any treatment or payment of participants. If you do not wish to take part, you do not have to give a reason and you will not be contacted again.

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Kind regards

Ms. A. Fixi

Ms. Anela Fixi : 083 433 4513 or 1655534@students.wits.ac.za

Prof. Danny Simatele : 011 717 6515 or Danny.Simatele@wits.ac.za (supervisor)

Ms. Shaun Schoeman: 011 717 1408 or Shaun.Schoeman@wits.ac.za (ethics committee administrative officer)

UNIVERSITY OF THE
WITWATERSRAND,
JOHANNESBURG

CONSENT FORM FOR COMMUNITY MEMBERS OF MBAZWANA LOCATION

Study title: The role of permaculture in promoting sustainable livelihoods and ecological conservation. A study of iSimangaliso Wetland Park in Umhlabuyalingana, Kwa-Zulu Natal

I hereby confirm that I have been well informed by study investigator Ms. Anela Fixi about the nature, conduct, benefits and risks of the study. I have also received, read and understood the participant information sheet regarding the study. I am aware that the results of the study will be anonymously processed and may, at any stage without prejudice withdraw my consent and participation in the study. The investigator translated and explained all the information in IsiZulu. I have had sufficient opportunity to ask questions and; therefore, I declare that;

I agree to take part in this research
Yes ( ) No ( )

I agree that the researcher may use anonymous quotes in his research report
Yes ( ) No ( )

I am/more than 18 years of age and prepared to voluntarily participate in the study Yes ( ) No ( )

I do agree to be audio-recorded /participate in the survey.
Yes ( ) No ( )

Participant's signature: ……

Date: ……..

I, Anela Fixi, herewith confirm that the above participant has been fully informed about the nature and conduct of the above study

STUDY INVESTIGATOR

Anela Fixi (Ms.)

Signature ---------- Date 11 October 2018

UNIVERSITY OF THE
WITWATERSRAND,
JOHANNESBURG

CONSENT FOR ISIMANGALISO WETLAND PARK MANAGEMENT AND EMPLOYEES, COMMUNITY HEADMAN AND HIS CABINET, AND MUNICIPALITY MANAGEMENT AND EMPLOYESS

Study title: The role of permaculture in promoting sustainable livelihoods and ecological conservation. A study of iSimangaliso Wetland Park in Umhlabuyalingana, Kwa-Zulu Natal

I hereby confirm that I have been well informed by study investigator Ms. Anela Fixi about the nature, conduct, benefits and risks of the study. I have also received, read and understood the participant information sheet regarding the study. I am aware that the results of the study will be anonymously processed and may, at any stage without prejudice withdraw my consent and participation in the study. I have had sufficient opportunity to ask questions and therefore; I declare that; I am/more than 18 years of age and prepared to voluntarily participate in the study.

I do agree to be audio-recorded /participate in the survey.

Yes ☐

No ☐

PARTICIPANT'S

Signature ----------Date----------

I, Anela Fixi, herewith confirm that the above participant has been fully informed about the nature and conduct of the above study

STUDY INVESTIGATOR

Anela Fixi (Ms.)

Signature ----------Date 11 October 2018