Economic valuation and natural resource rent as tools for wetland conservation in Swaziland: the case of Lawuba wetland

By

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DECLARATION OF ORIGINALITY

I hereby declare that this dissertation which I submit for the degree of MSc Agric (Agricultural Economics) at the University of Pretoria is my own work and it has not been previously submitted by me for a degree at this or any other institution of higher learning.

Signature .....
Linda Siphiwo Mahlalela
Date .....

Approved by:
Signature .....
Dr E.D. Mungatana
Date .....

DEDICATION

I dedicate this dissertation to the Creator of heavens and earth for His faithfulness, favour, and mercy. It is neither by power nor might but by the Spirit of the Lord.

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ABSTRACT

Deteriorating quantity and quality of wetland ecosystem services is a major challenge for the conservation of the Lawuba wetland: socioeconomically the most important wetland area in Swaziland. In response, this study was designed to assess local dependent communities' factual knowledge of the benefits and threats to the wetland, and their attitudes towards its conservation. In addition, the study employed environmental valuation techniques to estimate the annual economic value of the wetland's fibre provisioning services and four notions of resource rent associated with the harvested fibre: rent on fibre consumed on site as a final product; and rent on fibre transported for 90 kilometres to Manzini market where it is sold, either as a final product or used as an intermediate input in the production of handicrafts. The fibre ecosystem service was specifically selected on account of its socioeconomic significance. Value of the fibre provisioning service was estimated using market price-based methods, while the magnitude of the different notions of resource rent was estimated using the net price method.

A random sample of 63 respondents was used to provide data on the benefits, threats, attitudes, and annual economic value which households attach to the harvested fibre. This sample also provided data used to compute the resource rent associated with fibre harvested and consumed on-site. A random sample of 5 respondents provided data used to compute the resource rent on fibre transported and sold in Manzini as a final consumption good. Finally, a random sample of 5 respondents provided data used to compute the resource rent on fibre manufactured at Lawuba and sold in Manzini.

Households had high levels of knowledge of the benefits and threats to the Lawuba wetland. They also had positive attitudes towards its conservation. Chi-square and ANOVA tests rejected the null hypothesis of no association between household: (i) knowledge of the benefits derived from the wetland and income ($F = 12.67$, $p = 0.000$), (ii) knowledge of the threats endangering the wetland and education ($\chi^2 = 38.474$, $p = 0.000$), (iii) knowledge of the threats endangering the wetland and income ($F = 7.25$, $p = 0.000$), (iv) attitudes towards its conservation and income ($F = 13.320$, $p = 0.000$) and (v) attitudes towards its conservation and gender ($\chi^2 = 11.854$, $p = 0.003$). The value of fibre provisioning services was estimated at between US $20,310 and US $32,673 per annum, which translates to US $70 per capita per annum. Magnitude of the resource rent increased along the value chain as theory would predict. It was estimated at US $1.92 (for fibre harvested and consumed on site), US $2.27 (for fibre sold at Manzini as a final product), and US $18 (for fibre manufactured at Lawuba and sold in Manzini). Inasmuch as the study established a positive resource rent, no institutions currently exist for rent capture and appropriate re-investment to support sustainable wetland conservation. The study thus recommends the need to set up suitable resource management institutions.

Key words: Economic value of fibre provisioning ecosystem service, magnitude of natural resource rent and its capture, wetland conservation and sustainability of wetland provisioning services.

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ANOVA	–	Analysis of Variance
DFID	–	Department for International Development
IUCN	–	International Union for Conservation of Nature and Natural Resource
LW	–	Lawuba Wetland
MSY	–	Maximum Sustainable Yield
NEF	–	National Environment Fund
SEA	–	Swaziland Environmental Authority
TEV	–	Total Economic Value

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Communities living within and outside the periphery of wetlands[1] are highly dependent on wetland ecosystem services and are directly harmed by their degradation (Horwitz, Finlayson & Weinstein, 2012:1; Kibwage, Onyango & Bakamwesiga, 2008:97). Wetland ecosystem services contribute to human well-being and poverty reduction and hence directly support people's livelihoods. However, wetlands are consistently degraded and destroyed, more than any other ecosystem (Durigon, Hickey & Kosoy, 2012:36). For example, Caliskan (2008:1) reports that human actions have caused crucial wetland degradations leading to reduced social welfare. Similarly, Schuyt (2005:188) also reports that human activities leading to wetland degradation have reduced social welfare in all four cases studies which were examined: Nakivubo urban wetland in Uganda, Hadejia-Nguru wetlands in Nigeria, Lake Chilwa wetland in Malawi, and Zambezi Basin wetlands in Southern Africa.

Ultimate and proximate causes of wetland degradation pose serious threats to social welfare especially for local rural communities highly dependent on wetland resources. The main ultimate (distant) causes of wetland degradation include: the property rights system employed to govern access and management, poverty, lack of wetland policies or policy intervention failures, wetland conversion, demographic growth, severe economic stress, information failures, market failures, and urbanisation (Dugan, 1992:1; Turner, Van Den Bergh, Soderqvist, Barendregt, Van Den Straaten, Maltby, & Van Ireland, 2000:7; Heltberg, 2002:189; Schuyt, 2005:179). Proximate (direct and immediate) causes include overexploitation, drainage, groundwater pollution, livestock overgrazing and trampling, alien plant invasion, and erosion (Turner, Hadley, Luisetti, Lam & Cheung, 2010:11). For example, it is generally agreed that wetland resources continue to be characterised by overexploitation often caused by weak property right systems and lax enforcement (Stevenson, 1991; Adhikari, 2001:3; Heltberg, 2002:189).

[1]The Ramsar Convention on Wetlands defines wetlands as areas of fen, marsh, water or peatland, whether temporary or permanent, artificial or natural, with water that is flowing or static, fresh, salt or brackish, as well as marine water with depth not exceeding six meters at low tide (Ramsar Convention Bureau, 2010).

It is generally agreed that resource rent is a surplus value in economics, that is, the difference between an output price at which a resource could be sold in a competitive market and its relevant production and extraction costs, including a normal return to capital (Sharp, 2003; Department for International Development (DFID), 2003; Luchsinger & Müller, 2003; Stoneham, Lansdell, Cole & Strappazzon, 2005; Scherzer & Sinner, 2006). In order to maintain harvesting of wetland resources on a sustainable path, an individual should pay for every unit removed. Renewable wetland resources should be harvested in a way that strikes a balance between wetland use and its conservation without drastically reducing social welfare. Since the magnitude of resource rent which could be used as a policy instrument for wetland conservation is not known, individuals are not faced with the full consequences of their actions.

Lawuba wetland (LW) has been threatened by wetland degradation ultimately caused by a partial open access regime, weak property right system and lax enforcement, and lack of well-defined wetland policies. Proximate causes of wetland degradation threatening LW include livestock overgrazing and trampling, overharvesting, alien plant invasion, erosion and groundwater pollution. Knowledge of the causes of the degradation of LW is important in assessing households' attitudes towards its conservation. This study has been implemented with a view to estimating the resource rent of fibre provisioning ecosystem service and using it as a tool for wetland conservation. Fibre[2] is the most important wetland product to households at Lawuba because it contributes directly to household income, hence reducing unemployment and poverty. This ecosystem service has brought harmony and promoted sharing of handicraft and entrepreneurship skills, thus contributing to social capital. Fibre has also promoted women empowerment and gender equity as women are taking the lead in the conservation project (Hlophe, 2011; Perlis, 2012).

This dissertation comprises five chapters. Chapter 1 provides an introduction to the study. The rest of the dissertation is organised as follows: Chapter 2 reviews theoretical and empirical literature on resource rent and economic valuation of renewable natural resources. Chapter 3 describes the study area, research design, household characteristics of the sample and applied models. Results and discussion are presented in Chapter 4, while the conclusion and recommendations are presented in the last chapter of the dissertation, Chapter 5.

[2]Fibre refers wetland plants used for production of handicrafts, for example, *Cyperus spp.* and *Mascanthus spp.*

1.2 PROBLEM STATEMENT

Over the past years, LW has been exploited under the partial open access regime[3] without any appropriate management structure being put in place for monitoring its use for future generations. Each wetland user has an incentive to maximize his or her harvest under this regime. Although reducing the total harvest today may be in the collective interest (for example, by allowing fibre to regenerate and flourish), it is not rational for any individual wetland user to restrict his or her harvesting effort, as there is no guarantee that he or she will receive any reward that this may regenerate in terms of higher harvest later. Since there is no certainty that stock (fibre on site) will be available tomorrow, each wetland user exploits the wetland today to his or her maximum, subject only to the constraint that his or her revenues must cover the costs incurred. As a result, LW has been threatened by resource overharvesting, livestock overgrazing and trampling, alien plant invasion (*Lantana camara)*, erosion, and pollution. Agricultural cultivation at the edges of the wetland and water withdrawal also contribute to further degradation through water pollution and wetland drainage, respectively. The lack of fencing has been the main cause of livestock overgrazing and trampling, and also animal invasion (pigs) into the wetland, which has led to the extinction of an important medicinal wetland plant *Gunnera perpensa* (Gobho) whose roots are used for menstrual pain and male impotence. Wetland plant resources are harvested at a rate that exceeds their regeneration, leading to their extinction, especially of indigenous plant species, for instance plants like '*iminyentane*', *Breonadia salicina* '*umhlume*' and '*imikhakudze*' have been threatened to extinction.

There has been a growing interest within the Swaziland Government to conserve wetlands of economic importance which are endangered by the aforementioned threats. Therefore, the National Environment Fund (NEF) was proposed around 2001 in an effort to conserve wetlands and hence slow down or stop their degradation or loss. Consequently, the wetland conservation programme was implemented in LW in 2011. The communities in the Lawuba area participated in the conservation activities and also formed a wetland management

[3]LW is found in Swazi Nation Land which is under the traditional system of governance, hence it is owned by the state. Access to the wetland is uncontrolled while withdrawal (resource harvesting) is controlled by joint users with lax enforcement; it is managed by a selected committee of users and that committee is also responsible for exclusion (not currently enforced). These characteristics make it difficult to determine the existing type of property right regime (private, common, public and open access) in LW. Therefore, in this study, the current regime is referred to as the 'partial open access regime' as the regime has characteristics of public property (owned by state) while access is uncontrolled (open access).

committee in an endeavour to form an association of wetland users. The aim of the association was to control wetland access and use (timely harvesting), and also formulate local wetland legislations. The NEF fund has been used to fence the wetland, and as the project is still ongoing the fund will also be used for conservation management activities and development projects through a local participatory approach. However, there is currently no mechanism for sustaining the fund for future purposes as the conservation project will be terminated in 2013.

It follows that alternative resource management and conservation funding mechanisms must be explored. It is known from resource management theory that the concept of "resource rent" provides such an alternative (Mungatana, 2013:68). For resource rent to be used as a tool for natural resources management, two conditions must be fulfilled: first, the magnitude of the resource rent must be known. Second, institutions must exist for the efficient capture and re-investment of the resource rent. Currently in Lawuba, none of these conditions is satisfied. The magnitude of resource rent which could be used as a policy instrument for wetland conservation is not known and there are no institutions put in place to capture it. Therefore, individuals are not faced with the full consequences of their actions and this perpetuates degradation of LW. Despite government's effort to fence the wetland, it will continue to be degraded unless the welfare loss (economic value of the wetland) is realised and resource rent is implemented as a policy instrument for wetland conservation. Consequently, this study seeks to address the following questions: (1) What welfare loss would be incurred if the fibre ecosystem service were to be completely lost? (2) How much should be invested back to the resource to prevent such a loss? (3) Is LW degraded because households do not have: factual knowledge of its benefits and threats endangering it, and positive attitudes towards its conservation?

Estimating the resource rent of fibre is important in providing empirical evidence that can be used to propose an alternative way of achieving sustainable use, conservation and management of the wetland. This study can enhance the rising interest for wetland conservation from government and also attract funding from other organisations and institutions. The findings obtained can be most useful in justifying conservation and also can contribute to formulation of wetland policies. Understanding the economic value of fibre can also be useful in decision making.

1.3 HYPOTHESES

i. Natural resource rents depend on use rates, level of the resource and exogenous variables in context including prices. Assuming that the resource is beneficial, resource rents as defined are nonnegative. In open access without regulation, competition drives rent to zero (Gordon, 1954:135; Scott, 1954; Freeman, 1991:248). However, when a wetland is exploited under partial open access condition with regulation, the rent is nonnegative, hence it was hypothesised that resource rent of fibre provisioning ecosystem service from LW is positive or nonnegative (significantly different from zero) under a partial open access system.

ii. Factors influencing attitudes towards wetland conservation include: socioeconomic conditions (gender, age, education, and income or economic status), resource use, access to resource and participation in conservation activities (Sah & Heinen, 2001:346; Baral & Heinen, 2007:7-8). In literature, studies' findings (Mehta & Heinen, 2001:174; Sah & Heinen, 2001:346) suggest that males had positive attitudes towards wetland conservation while other studies (Danna & Clive, 1999; Torkar, Mohar, Gregorc, Nekrep & Adamic, 2010) suggest that females had positive attitudes towards wetland conservation. However, one of the common factors driving these findings is participation in conservation activities and ratio (males against females) of the samples. Generally, people with high levels of education, in contrast to people with little or no education, are in a better position to comprehend the importance of conservation (as they have access to more sources of information), hence resulting to positive attitudes towards conservation of wetlands being expressed (Mehta & Heinen, 2001:174; Sah & Heinen, 2001:346). Poor households dependent on a natural resource for their livelihoods (sometimes as a primary source of income) are most likely to express positive attitudes towards conservation of that resource (Lam, 2004:9; Sah & Heinen, 2001:346; Mironga, 2005; Dahlberg & Burlando, 2009). Therefore, the study hypothesised that:

(1) Neither males nor females have positive attitudes towards conservation of LW.
(2) Younger people have positive attitudes towards conservation of LW.
(3) Household heads with low levels of education have positive attitudes towards conservation of LW.

(4) Households with higher levels of income have positive attitudes towards conservation of LW.

1.4 OBJECTIVES OF THE STUDY

The main objective of this study is to estimate the resource rent of fibre provisioning ecosystem service in LW using the net price method.

The study was guided by the following specific objectives:

i. To assess households' knowledge of benefits, knowledge of threats, and attitudes towards conservation of LW.
ii. To estimate the economic value of fibre provisioning ecosystem service from the LW using the market price based method.
iii. To estimate the resource rent of fibre provisioning ecosystem service from the LW using the net price method.

1.5 IMPORTANCE AND BENEFITS OF THE STUDY

The study makes a contribution to the already existing body of knowledge on the economic valuation and resource rent of fibre provisioning ecosystem services as a tool for wetland conservation, from a theoretical and academic perspective. It estimates the amount of resource rent captured along the handicraft value chain by wetland users (households harvesting fibre) when there is competition for the resource under a partial open access regime and also determines the economic value of fibre provisioning at an empirical level. However, from a practical perspective, the findings would assist policy makers in decision-making processes and in formulating or reforming wetland policies in a way that would strike a balance between wetland conservation, conversion, management and sustainable use. The concept of resource rent could be made part of the wetland management policy and hence enable rent recovery mechanisms that could be used to capture the value of externalities otherwise unaccounted for.

This study could further raise the awareness of the value and importance of provisioning ecosystem services to wetland users and policy or decision makers. When decision making is made, regarding wetlands, with inadequate knowledge of attitudes about and practices of wetland resource use, conservation programmes are unlikely to be successful (Sah & Heinen, 2001:346). Therefore, results of the assessment of knowledge and attitudes towards conservation of LW could be used to enhance the successful implementation the current conservation project at Lawuba. Further, putting a value on wetland ecosystem provisioning services will ensure that they are acknowledged better and accounted for in decision-making (Emerton, 2009:75). More importantly, the rent captured by wetland users could be used promote wetland conservation through rent collection mechanisms.

CHAPTER 2

THEORETICAL AND EMPIRICAL LITERATURE

2.1 INTRODUCTION

The first objective of this chapter is to present the conceptual framework for the study using concepts embedded in natural resource rent theory and property right theory. The second objective is to review theoretical and empirical literature on resource rent, economic valuation (market-based valuation method), property rights, and renewable resource use and conservation. These objectives are aimed at identifying knowledge gaps and hence highlight the contribution of the study.

The chapter is organised into the following sections. Section 2.2 reviews the theoretical literature in the following sub-sections: section 2.2.1 which presents the concept of resource rent, section 2.2.2 presents the theory underlying market price-based method, and section 2.2.3 which presents the theory underlying property rights and conservation of wetlands. Section 2.3 reviews the empirical literature through comparative studies. Section 2.4 presents knowledge gaps

2.2 THEORETICAL LITERATURE

2.2.1 The concept of resource rent

The concept of resource rent has its genesis in Ricardo's principles of 1819. The potential source of resource rent, which is also scarcity rent, has its origins in the study conducted by Hotelling (1931). Banfi, Filippini and Luchsinger (2004:1) define resource rent as the surplus above the value of labour, materials, capital and energy used in exploiting that resource. Rodgers and Wester (2007:3) also define resource rent as excess profit or super normal profit over the level earned in a competitive market, hence it is equal to the difference between revenue and costs (including a competitive return on capital). It is generally agreed that rent is a surplus value in economics as illustrated in Figure 2.1, that is, the difference between an output price at which a resource could be sold in a competitive market and its relevant

production and extraction costs, including a normal return to capital (Sharp, 2003; Department for International Development (DFID), 2003; Luchsinger & Müller, 2003; Stoneham, Lansdell, Cole & Strappazzon, 2005; Scherzer & Sinner, 2006). Therefore, resource rent represents a return to the community for the exclusive use of resources. Theoretically, resource rent is the value of the resource in situ and should be re-invested back into the resource.

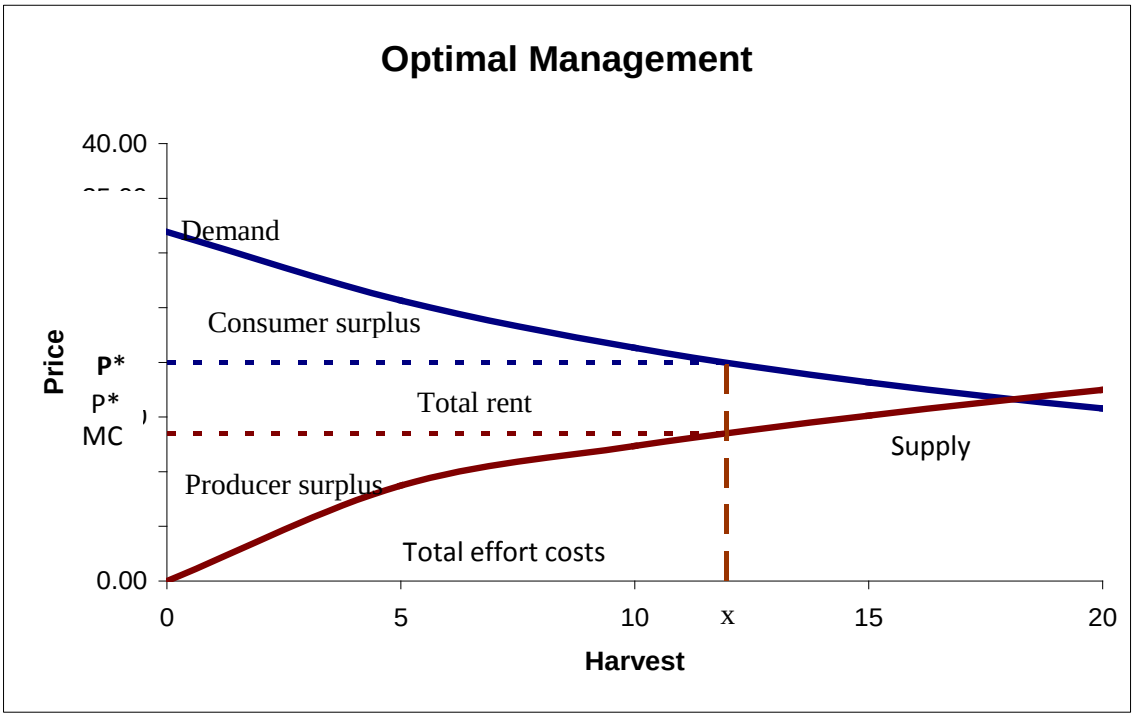

Figure 2.1: Resource use activity: resource rent
Source: Adapted from Perman, Ma, McGilvray & Common (2003).

The magnitude of resource rent is varies according to property right regime and management system. P* is the market price of the harvested resource and p* is the price of the resource on site and MC is the marginal cost of harvesting quantity x. In this example, the resource is optimally managed, hence positive resource rents accrue to both producers and consumers. Therefore, resource rent (total rent in this example) is the difference between the output price and marginal cost of harvesting the resource (RR = P* - MC). Natural resource rent is more than just a monetary concept. In natural resource economics literature, the importance of resource rent is highlighted in various contexts. Collection of resource rents may induce ownership over natural resources, especially under public and common property right systems. For example, ownership includes a bundle of rights such as the right to benefit from using a resource and the right to some form of return (Ostrom, 1999). Resource rent collection

is important in avoiding inefficient allocation of resources and achieving ethical objectives (Scherzer & Sinner, 2006:11). According to Mungatana (2013:68), resource rent is an important source of revenue for managing a natural resource and for funding development and investment, hence its main use is to promote sustainable development. Other scholars perceive resource rent as a source of inequality, measure of economic efficiency, contributor to economic growth and a subject for taxation (Samuelson, 1974; Homans & Wilen, 2003; Sachs & Warner, 2001; Grafton, 1995).

Four propositions can be identified from natural resource rent theory. These propositions lead to the first hypothesis and relate to the main concept of the study (resource rent). Proposition 1 states that natural resource rents depend on use rates in general, level of the resource and exogenous variables in context, including prices. Proposition 2 states that, assuming that the resource is beneficial, resource rents as defined by proposition 1, are nonnegative. Proposition 3 states that in a common property resource use, when there are no use constraints, equilibrium resource rents will be zero. Proposition 4 states that in open access without regulation, competition drives rent to zero (Gordon, 1954:135; Scott, 1954). It is thus on this premise that it is hypothesised that resource rents are nonnegative in a partial open access system with regulation.

In theory, the price of a depletable resource consists of two components: depletion cost or resource rent and production cost (Hotelling, 1931). Santopietro (1998:39) contests that the surplus accruing to the resource owners or beneficiaries after taking into account the contribution of labour and capital inputs is the common measure for resource rent. Freeman (1991:248) refers to resource rent as producers' surplus. In the study conducted by Santopietro (1998), diverse methods for attaining an estimate of the surplus (resource rent) were reviewed and criticised. These methods are: present value of future income, net price method, El-Serafy method, transaction value, sustainable price, replacement cost (one-half net price), replacement cost (discovery value), and stock market evaluation.

It is theoretically possible to estimate the surplus (resource rent) value generated by a natural resource reserve either as the market value of reserves sold or present value of future net income from extractions; this is because in a competitive market the sales price should be equal to the present value of future returns. Therefore, a current resource beneficiary or owner would not want to sell for less and a buyer would not pay any greater amount, hence this sales

price is also called or known as the transaction value. However, in practice it has proved difficult to find a value for this theoretical value of resource rent (Santopietro, 1998:40). Therefore, the preferred methods for estimating resource rent should be those that make use of available data and rely least upon assumptions made by analysts (Repetto *et al.*, 1989 quoted by Santopietro, 1998:40). Hence, the net price method, which is the current price per unit and current average cost as a measure of per unit rent, has been subsequently used in numerous analyses (Santopietro, 1998:40).

2.2.1.1 Theory underlying the net price method

According to Santopietro (1998), the net price method can be justified as a measure of long-run rent if a number of important assumptions are true and it therefore portrays a view that the whole surplus from production should counted as depletion cost. These assumptions include: perfectly competitive markets, optimal management, endogenous prices, endogenous cost and absence of production constraints. The depletion cost is the amount that has to be reinvested in order to sustain the ability of the economy to provide future generations with the ability to enjoy a non-declining level of consumption. In this line of thinking, Santopietro (1998:40) argues that the net price method overstates the true depletion cost and on another note, the use of net price method may underestimate the resource's depletion value because of distortions on the cost side of the formula.

2.2.2 Theory underlying the market price-based method

Generally, there are three broad approaches found in literature that are used to elicit the monetary values of ecosystem services, namely: direct market valuation; revealed preference valuation; and stated preference valuation (Barbier, Acreman & Knowler, 1997:42; Lambert, 2003:7-8; Rasul, Chettri & Sharma, 2011:7-8, Mungatana & Muchapondwa, 2012:21). It is often difficult to apply market prices to wetlands goods because some wetland products have no market. If markets do not exist for the goods or ecosystem service, then the data for the first two approaches are not available, leaving the stated preference valuation as the only option.

Lambert (2003:6) defines the total economic value (TEV) of wetlands as the "full amount of resources individuals are willing to forego for an increased amount of wetland services".

Although total revenue has been and in this study used as a proxy economic value, valuation methods and literature sees economic value as a broader concept. Therefore, the total economic value (TEV) is a value concept of interest to the economic monetary valuation of ecosystem services and it consists of both use values and non-use values (Mungatana & Muchapondwa, 2012:5). Rasul *et al.* (2011:7) assert that estimating direct use values is straightforward since it relies on existing marketing prices, hence data on input quantities, output quantities, prices and costs are easy to obtain. Nevertheless, the direct market valuation approach consists of three main methods: market price-based method, cost-based method, and production function-based method.

2.2.2.1 Advantages of using the market price-based method

The main advantage of employing the market price technique is that it utilises data from actual production processes and markets, and hence reflects consumer preferences (Mungatana & Muchapondwa, 2012:5). Nevertheless, the market price-based method is usually preferred against other direct valuation methods for its simplicity and reduced biasness. This method is frequently used to obtain the value of fibre provisioning service because markets often exist (Springate-Baginski, Allen & Darwall, 2009:82). According to Howarth and Farber (2002:424), market prices reflect an individual's marginal or 'private' willingness to pay for the traded ecosystem service from a wetland ecosystem.

The market price-based method has an advantage of having a relative ease of use and of obtaining price data. Further, it requires few assumptions with little detailed modelling and simple statistical analysis for its application requirements (Springate-Baginski *et al.*, 2009:84). Nonetheless, the disadvantage is that policy failures and market imperfections may distort market prices, and will consequently fail to reflect the economic value of commodities to society as a whole (Lambert, 2003:7; De Groot, Stuip, Finlayson & Davidson, 2006:24; Springate-Baginski *et al.,* 2009:84). Despite the availability of market prices, there is a need to adjust them to take into account distortions such as taxes and subsidies. Shadow prices (market prices adjusted for market imperfection, policy distortions and transfer payments) can be used to reduce biasness in the valuation. The advantage of using shadow prices is that efficiency prices reflect the true economic value or opportunity cost of ecosystem services traded in markets. However, the disadvantage is that the derivation of efficiency prices is complex and may require substantial data. Moreover, decision makers may not accept what

they consider to be 'artificial' prices (Mungatana & Muchapondwa, 2012:5). Therefore, the shadow price of fibre is its value in situ and usually obtained through optimisation. However, the shadow price of fibre can be reflected by the resource rent (difference between total revenue and cost), which is the closest approximation.

2.2.3 Theory underlying natural resource property rights and conservation over wetland provisioning ecosystem services

Resource rent and economic values of resource depend partly on the management regime, or rather, property right regime. Kirsten, Karaan and Dorward (2012:47) define property rights as a fundamental institution which governs who can do what with resources. Property rights over a resource involves ownership, hence a bundle of rights (Ostrom, 1999; Kirsten *et al.*, 2012:47). These rights include: extraction rights, transfer rights, user rights, exclusion rights and encumbrance rights. Wetland resources continue to be characterised by overexploitation, often caused by weak property right systems and lax enforcement (Stevenson, 1991; Adhikari, 2001; Heltberg, 2002). However, property right failures might be addressed by the following regulations: tradable quotas (such as individual tradable quotas, ITQs), assignment of rights, liability rules and user fees.

According to Copeland and Taylor (2009:1), success or failure in managing a resource is determined by three forces: ability of the resource to generate competitive returns without being extinguished, extent of harvesting capacity, and the regulator's enforcement power. However, with regard to renewable resources such as wetlands, property rights are both often difficult to define and poorly enforced. Wetland degradation often calls for conservation to prevent extinction of important biological species. On the other hand, institutions should promote community livelihoods and sustainable use of wetland resources simultaneously (Kibwage *et al.*, 2008:99). Attitudes towards wetland conservation depend on whether households receive tangible benefits from the wetland under conservation. From example, households receiving benefits from a conservation project are more likely to have or rather express positive attitudes towards conservation (Studsrød & Wegge, 1995). On the other hand, if the benefits are not equally distributed, regardless of the benefits, negative attitudes are frequently expressed (Parry & Campbell, 1992).

Clark (1973:951) notes that a rent-maximising policy will automatically lead to biological conservation if harvesting costs rise with decreasing resource stock level. Therefore, there is an increasing awareness of the desirability, among developing countries, of using user fees to capture a share of rents from local natural resources (Boadway & Flatters, 1993:1). However, it is argued that exclusion from important wetland resources subsequently to changes to property right regimes exposes poorer households dependent on these wetland resources for their livelihoods to increasing vulnerability and further deprivation (Adhikari, 2001:3). Resource rent collection can help address wetland degradation through conservation. Sustainability of wetland ecosystem service can be achieved if wetland resource users could be held accountable for every unit of the resource harvested. Resource rent should be paid by the resource users for every unit harvested. Hence there is need to provide empirical evidence of the rent accruing from exploiting wetland resources.

In the study conducted by Freeman (1991), results showed that wetland resource values were not only influenced by economic and biological factors, but also by institutions and management policies. Wetlands operating under open access conditions imply rent dissipation where price equals average cost and total revenue equals total costs. Clarke, Reed and Shrestha (1992:274) argue that efficient utilisation of a renewable resource involves generation of positive rentals which in turn leads to rent dissipation through provision of an incentive for illegal use. This suggests that estimation of the value and rents of wetland provisioning ecosystem services is of primary importance so as to necessitate property rights enforcement and hence promote wetland conservation. In literature, many empirical studies (Emerton, 1998; Turpie, Smith, Emerton & Barnes, 1999; Turpie, 2000; Adekola, Morardet, de Groot & Grelot, 2008; Lannas & Turpie, 2009) have focused on the aspect of estimating the economic value wetland provisioning ecosystem services while only a few (Turpie *et al.*, 1999; Adekola *et al.*, 2008) have estimated the economic net value (profit) of wetland provisioning ecosystem services. In theory, resource rent is not the same as the economic net value (profit). Therefore, there is a need to provide empirical evidence of rents from wetland fibre provisioning ecosystem service.

2.3 EMPIRICAL LITERATURE

2.3.1 Empirical comparative studies

2.3.1.1 Natural resource rent of fibre provisioning ecosystem service

Very few studies (Turpie *et al.*, 1999; Adekola *et al.*, 2008) have applied the concept of resource rent in practice in the economic valuation of fibre provisioning ecosystem services using the market price-based method. In these studies the net price method was used. For instance, in the study conducted by Turpie *et al.* (1999), the annual economic value of fibre reeds and papyrus was estimated to be US $161,979 and US $156,857 respectively, and after accounting for costs the annual economic net value (resource rent) was estimated to be US $135,202 and US $111,549 respectively. Similarly, Adekola *et al.* (2008) also used the net price method in estimating the resource rent of fibre using the market price technique. The annual financial value of fibre reeds and sedge was estimated to be US $7,820 and US $594, while the annual net financial value (resource rent) was US $7,795. In both these studies the net price excluded the return on capital, hence the entire surplus was attributed to fibre.

Since in theory resource rent must include return on capital, it remains questionable whether these net prices from the above studies could be referred to resource rent. Conceptually, rent still exists even when it is not paid, since it is basically captured by users of that resource (Scherzer & Sinner, 2006). Scherzer and Sinner (2006) further argue that if there is no competition for that resource that is not a problem: however, if there is competition for that resource, questions arise as to how much natural resource rent is being captured by those users, other than that paid to resource owners. There is therefore need to provide empirical evidence on the resource rent of fibre provisioning service compatible with natural resource rent theory.

2.3.1.2 Economic valuation of fibre provisioning ecosystem service

Most empirical studies conducted on the economic valuation of provisioning ecosystem services, especially fibre, have employed market price-based method. Turpie *et al.* (1999) conducted an economic valuation survey in an attempt to assess the economic value of wetland goods and services in four Zambezi Basin wetlands. Results suggested that the fibre

(reeds and papyrus), including the value added through processing, yielded a financial net income ranging from US $19 to US $129 per household per year, using the market price method. The total annual economic value was estimated to be between US $436,000 and US $2.8million. Moreover, wetland user households harvested 9 bundles of papyrus on average per year and each bundle was sold at K1,200 (Zambian currency – Kwacha).

In a study conducted by Turpie (2000), approximately 1,600 bundles of sedges and 19,000 bundles of reeds were harvested annually with a gross income of US $600 and US $6,700, respectively. The main objective of Turpie's study was to articulate the economic value of key ecosystems and natural resources of the Rufiji floodplain and delta. Further, a case study was conducted by Emerton (1998) at the Nakivubo Urban wetland in Uganda, where the market price technique was also used to estimate the economic value of fibre (Schuijt, 2002). The economic value of fibre (papyrus) was estimated to be US $17,409 and was harvested by 50 wetland users.

Adekola *et al.* (2008) also conducted an economic valuation study in the Ga-Mampa wetland, South Africa. Results suggested that the annual reed harvest was estimated to be 2,526 bundles with an annual gross value of US $7,820. Adekola *et al.* (2008) reported that a bundle of reeds was about 60cm in diameter and weighed between 5 and 10kg. Some 756 bundles of sedges were harvested annually. About 0.75 of a bundle of sedge was used to make one mat, hence approximately 750 mats were made annually overall. A bundle was sold at R20 and a mat at R80, hence the average annual gross factor value was estimated to be US $9,288. Taking monetary costs into consideration, the annual net factor value was estimated to be US $7,918 while the cash derived from the sales of mats and bundles of sedge was US $7,728. Adekola *et al.* (2008) articulated the concept of resource rent of fibre. Lannas and Turpie (2009) conducted a valuation study where a rural wetland (Letseng-la-Letsie) in Lesotho was contrasted with a peri-urban wetland (Mfuleni) in South Africa. It was concluded that households around Letseng-la-Letsie derived less income (6%) from the wetland, compared to 82% in Mfuleni. The annual income from the sale of craft was estimated to US $1,200 in Letseng-la-Letsie wetland compared to be US $6,668 in Mfuleni wetland.

2.3.1.3 Attitudes towards wetland conservation

Meaningful wetland protection calls for learning about their value and knowledge about wetland ecosystems (Kaplowitz, 2003:4). In the study conducted by Kaplowitz (2003) on perceptions of wetlands and mitigation, results suggested that Michigan residents were very familiar and knowledgeable about wetland resources. The Michigan residents valued wetlands highly, regardless of political affiliation, and seemed to desire wetland policies that maintained the mixture of wetland types in existence. Sah and Heinen (2001) also conducted a study on wetland resource use and conservation attitudes among indigenous and migrant peoples in Ghodaghodi Lake area, Nepal. The findings showed that most respondents expressed willingness to participate in the conservation of the Ghodaghodi Lake. It was concluded that education level and resource use strongly influenced conservation attitudes.

2.4 KNOWLEDGE GAPS

The literature overview above reveals gaps in empirical evidence on the resource rent of fibre provisioning ecosystem service. One of the major problems noted is the lack of basic information with regard to evidence of the resource rent of fibre. Obtaining data on this gap is imperative because natural resource rent could be used as a regulatory tool for wetland conservation, while simultaneously striking a balance between community livelihoods and sustainable use of wetland resources. Wetland resources provide tangible benefits to households, especially in communities where there is poverty and hence have become an alternative source of livelihoods.

2.5 STUDY HYPOTHESES

i. Natural resource rents depend on use rates, level of the resource and exogenous variables in context, including prices. Assuming that the resource is beneficial, resource rents as defined are nonnegative. In open access without regulation, competition drives rent to zero (Gordon, 1954:135; Scott, 1954; Freeman, 1991:248). However, when a wetland is exploited under partial open access conditions with regulation, the rent is nonnegative, hence it was hypothesised that resource rent of fibre provisioning ecosystem service from LW is positive or nonnegative (significantly different from zero) under a partial open access system.

iii. Factors influencing attitudes on wetland conservation include: socioeconomic conditions (gender, age, education, and income or economic status), resource use, access to resource and participation in conservation activities (Sah & Heinen, 2001:346; Baral & Heinen, 2007:7-8). In literature, studies' findings (Mehta & Heinen, 2001:174; Sah & Heinen, 2001:346) suggest that males had positive attitudes towards wetland conservation while other studies (Danna & Clive, 1999; Torkar, Mohar, Gregorc, Nekrep & Adamic, 2010) suggest that females had positive attitudes towards wetland conservation. However, one of the common factors driving these findings is participation in conservation activities and ratio (males against females) of the samples. Generally, people with high levels of education, in contrast to people with little or no education, are in a better position to comprehend the importance of conservation (as they have access to more sources of information), hence resulting to positive attitudes towards conservation of wetlands being expressed (Mehta & Heinen, 2001:174; Sah & Heinen, 2001:346). Poor households dependent on a natural resource for their livelihoods (sometimes as a primary source of income) are most likely to express positive attitudes towards conservation of that resource (Lam, 2004:9; Sah & Heinen, 2001:346; Mironga, 2005; Dahlberg & Burlando, 2009). Therefore, the study hypothesised that:

(1) Neither males nor females have positive attitudes towards conservation of LW.
(2) Younger people have positive attitudes towards conservation of LW.
(3) Household heads with low levels of education have positive attitudes towards conservation of LW.
(4) Households with higher levels of income have positive attitudes towards conservation of LW.

2.6 CONCLUDING SUMMARY

The objective of this chapter was to provide the conceptual framework for the identified research problem, over and above a review relevant theoretical and empirical literature. The theoretical and empirical review of literature revealed significant gaps in resource rent empirical evidence on wetland resources. It can be concluded that resource rent as a regulatory tool has not been sufficiently articulated in wetland management, use and conservation policy and practice. Further, the review of literature shows that property rights

matter and that open access regimes create economic, as well as biological, problems that may lead to extinction of wetland resources.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter presents the methodology employed in the study and contains ten detailed sessions. Section 3.2 presents discussion on the study area while section 3.3 discusses sampling. Survey instrument and development discussion is in section 3.4, followed by survey implementation in section 3.5. This is followed by data analysis and variable description, discussed in section 3.6 and section 3.7 respectively. The household characteristics of the sample are presented and discussed in section 3.8. In section 3.9, the chi-square tests, one-way ANOVA and resource rent models are presented. Finally, section 3.10 provides a brief summary of aforementioned sections in the concluding remarks.

3.2 STUDY AREA

The Lawuba wetland (27°1′ 33.90°S, 31°28′ 13.49°E) is situated in Shiselweni region, at Hlathikhulu (shown in Appendix C) under the Sandleni constituency composed of the following sub-constituencies (imiphakatsi): Mbangweni, kaGwegwe, kaMavimbela, kaMhlanga, Ezulwini, Emoyihhuku (Mooihoek), kaHhihliza, koNtshingila and eJerusalem. It covers an area of about 20 ha which is equivalent to 0.21 km^2 and attains its uniqueness from its location in the valley where the water table is high. Lawuba community is found in the Middleveld ecological region, heartland of the Swazi nation, a region of rolling uplands and wide, well-watered valleys locally known as “The Navel” or Inkabave (Mason, 2013).

The climatic condition is generally subtropical. Lawuba occupies an intermediary position between temperatures in the Highveld and Lowveld. The average minimum and maximum monthly temperatures in the Highveld are 11° C (52° F) and 22° C (72° F) while in the Lowveld they are 15° C (59° F) and 29° C (84° F). This area receives an average annual rainfall of 34 inches; however, over the past few years it has varied between 13 inches and 63 inches, with 80% of the precipitation falling during October and March, the summer months (Mason, 2013).

Lawuba is mainly composed of aquatic biome and forest biome which makes it rich in flora, mostly with hydrophytes, since it has well-watered valleys complemented by favourable climatic conditions. LW is habitant to biodiversity (fauna especially birds and flora) which has not been specifically recorded and reported in empirical findings.

LW is the most socioeconomically important wetland area in Swaziland. It has a distinctive fibre provisioning ecosystem service which directly contributes to household income. Sivule wetland is about 12 ha, Luve wetland is about 10 ha, Sigwe is about 6 ha while LW is about 20 ha. The actual total number of wetlands in Swaziland is not known, however, there are over 20 known wetlands. These wetlands are all inland and consist of marshes, moreover, there are characterised by degradation which varies in intensity. LW is comparably rich in flora, particularly fibre (the most income generating wetland product in Swaziland). Results from the study show that fibre accounts for approximately 36% of the monthly household income. Household mean monthly income was estimated to be approximately 619.41 SZL which is approximately US $62, with the exchange rate at US $1 = 9.99 SZL in August 2013. Findings from the study concur with Perlis (2012) who asserts that the LW fibre provisioning ecosystem improved monthly household income to about US $100 (with the exchange rate at US $1 = 6.19 SZL in 2012). According to the United State Department of State Human Rights Report (2012), the minimum monthly wages for semiskilled and skilled workers in the handcraft industry are 657 SZL and 713 SZL, respectively. The fibre species harvested specifically for production of handcraft products include: *Cyperus latifolius* (likhwane), *Cyperus articulates* (inchoboza) and *Miscanthus capensis* (umtsala). This does not to imply that LW contains only these species, as it is also rich in flora species consisting of medicinal plants and highly nutritious palatable grass species for livestock (plates of fibre shown in Appendix D). However, the main focus of this study was on the fibre species used in the handicraft production sector.

***Cyperus latifolius* (likhwane)**

Cyperus latifolius (likhwane) is characterised by broad leaves endowed with bracts reaching a height of about 1.2 metres. A bundle weighs between 8 and 10 kilograms. According to Zwane, Masarirambi, Seyoum and Nkosi (2011:776), this robust plant is available for harvesting only once a year from April to June. However, in LW this species is harvested from April to October. It is clear that the traditional system is weakening in enforcing

environmental legislation through norms via chiefs in controlling harvesting of wetland goods. In a study conducted in Swaziland, Boitumelo (2010) also concluded that 70% of handicraft products sold in two of the major cities were made from this species. This is illustrated in Table 4.7 where approximately 70% of the total number of bundles harvested is from *Cyperus latifolius* (likhwane).

***Cyperus articulates* (inchoboza)**

This species is identified by robust, septate, leafless culms and large terminal inflorescence with minute inflorescence-bracts, with its height ranging between 0.6 to 1.6 metres. A bundle weighs about 10 kilograms on average. Similar to *C. latifolius*, it is harvested from April to October. *C. articulatus* is also in abundance in LW following after *C. latifolius*. This does not in any way explain why a large percentage of the total number of bundles harvested (68%) was *C. latifolius*. It can be argued that *C. articulates* is comparably less durable, hence its product price range is quite higher. Crafters earn more income per bundle from products made from *C. latifolius*, especially in the absence of information asymmetry on the products and their prices.

***Miscanthus capensis* (umtsala)**

This grass species is very rare in LW; it is usually found scattered in relatively small quantities all over the wetland. Only about 1% of *Miscanthus capensis* was harvested during the last harvesting season. The respondents also pointed out the lack for processing skills of this species which is a contributory factor to its poor harvest, in addition to its scarcity in LW. Table 3.1 below summarises the uses of the natural fibre species discussed above.

Table 3.1: Uses of natural fibre species from LW

Botanical name	Authority family	Local name	Uses
Cyperus latifolius	Cyperaceae	Likhwane	Sleeping mats Wall hangers
Cyperus articulates	Cyperaceae	Inchoboza	Sleeping mats Wall hangers
Miscanthus capensis	Poaceae	Umtsala	Traditional ceiling Traditional brooms Laundry baskets Flower baskets

Source: Zwane et al. 2011.

These are the current general uses of the three fibre species exploited in Swaziland. Both the *Cyperus spp.* harvested from LW are mostly processed into sleeping mats while *M. capensis*is mostly processed into traditional brooms. Crafters in Manzini purchase raw fibre (as an input in their production functions), process it and sell the final products to the local population which includes: those who purchase final handcraft products for export to South Africa, purchase fibre products (especially mats) for traditional weddings and those who purchase for use in their homesteads.

3.3 SAMPLING

The study employed both purposive and simple random sampling methods in arriving at a sample of wetland users from Lawuba. Lawuba wetland (LW) was selected purposely because it is regarded as of economic importance that improves rural livelihoods in Swaziland. It is one of the largest wetlands currently under a national conservation programme and is endowed with vast ecosystem services, good hydrology and about two springs. The sampling frame consisted of all wetland users (households) at Lawuba, who amounted to 253 at the time the study was conducted. Non-wetland users were not considered in the sampling frame. Wetland users might provide less units of harvested due to the fear that resource rent might be collected. A separate sampling frame comprised crafters in Lawuba. The two sampling frames were utilised to enhance the achievement of objective three, where separate rents of fibre and its products were computed. Random sampling was used in both sampling frames. Some 63 respondents were randomly selected for interviews at Lawuba to provide data on the benefits, threats, attitudes, and the annual economic value households attach to the harvested fibre. The respondents were scattered across nine sub-constituencies of the Sandleni constituency in Hlathikhulu. These sub-constituencies had fair representation of wetland users, when also considering the population size of households which was about 400 households. A random sample of 5 respondents was selected to provide data used to compute the resource rent on fibre transported and sold in Manzini as a final consumption good. A random sample of 5 respondents was selected to provide data to compute the resource rent on fibre processed at Lawuba, transported and sold in Manzini. Eventually, a random sample of 5 respondents was selected to provide data used to compute the resource rent on fibre sold in Manzini as an intermediate input in the production of handicrafts. The interviewed respondents represented households.

3.4 SURVEY INSTRUMENT AND DEVELOPMENT

The survey questionnaire was developed in conjunction with the specific objectives of the study. It was carefully designed to capture all the relevant information that could be used in addressing the research problem. Therefore, a pre-test of the instrument was conducted where ten random wetland users were interviewed, which took about 20-30 minutes. This necessitated a thorough revision of the questionnaire, based on the findings. Further, weaknesses in the way the questions were asked were identified and enhanced, and finally three research assistants were trained and coached. Both the pre-test and informal interviews yielded important information that was used to ensure that the questionnaire was logically sound, clearly understood and adhered to the community's traditional ethics.

The survey questionnaire was structured into five parts designed to capture information coherently. Part one captured the general information while part two included questions capturing demographic information. Questions designed specifically to capture objective three were asked in part three which inquired into the knowledge, perceptions and attitudes on conservation of LW. Part four was designed to address objective one and objective two, which covered the economic valuation of fibre ecosystem service and capturing rents associated with harvesting fibre from LW. Respondents were asked to estimate the total bundles of raw fibre they harvested from the last harvesting season based on recall. The last part asked debriefing questions so as to ensure the validity and reliability of responses.

3.5 SURVEY IMPLEMENTATION

Face to face interviews were conducted at Lawuba where all the respondents were wetland users. The interviews took 10 – 25 minutes per interview on average. Respondents needed assurance of the confidentiality of information, especially when stating their views on LW and its management. The implementation of the survey coincided with conservation activities, specifically wetland fencing. Respondents were consequently more collaborative than expected, leading to more reliable responses. There were follow up questions, especially on the knowledge, perceptions and attitudes on conservation of LW so as to ascertain the validity and reliability of responses which was also complemented by the last part of debriefing questions in the questionnaire. Informal interviews were also conducted, supplementing the survey questionnaires, with government officials from the Swaziland Environment Authority

(SEA), traditional leaders and community elders at Lawuba (key informants), the Deputy Prime Minister of Swaziland residing at Lawuba, and lecturers at the University of Swaziland. The respondents seemed to have understood and answered the questions truthfully, given the way the questionnaire was carefully designed, pre-tested, refined and finally implemented. Therefore, the study used a valid and suitable tool, the questionnaire, and this was confirmed by the examination of the pre-test responses. Internal consistency checks were also conducted through examination of the debriefing questions in the survey instrument. Results showed that the respondents understood the questions and their responses were quite reliable.

3.6 DATA ANALYSIS

The first objective of the study was to estimate the economic value of fibre provisioning ecosystem service in LW. In computing the monetary value of fibre harvested, the market price of raw fibre used the notion that the market in the handcraft sector in Swaziland is competitive. The handcraft market is characterised by: a large number of firms, identical products, free entry and exit to the industry, and knowledge of prices and technology. Market prices of ecosystem services and goods are usually distorted by market imperfections and policy failures, hence this leads to biasness in the market-price valuation method. In this study, however, shadow pricing was used to adjust monetary or financial values into economic values. There was therefore no need to adjust monetary value in objective 2 since the theory of resource rent was applied in objective 3.

3.7 VARIABLE DESCRIPTION

The main variables used in the analysis are described in this section. The descriptive statistics used to describe the main variables are means and standard deviations. The main output variables are economic value and resource rent of fibre. Variables used to capture the constructs: knowledge, perception and knowledge are considered as input variables. However, these constructs are also inputs in the function of resource rent of fibre.

In the economic valuation model, Y_t referred to the economic value of fibre harvested annually for the 2011/2012 wetland season, measured in SZL. The quantity Q_t referred to the annual number of bundles harvested in the last harvesting season (by species). Price P_t used in

this study was the prevailing market price of a bundle of raw fibre at the time the study was conducted.

In the resource rent model, RR_t referred to the annual unit rent fibre measured in SZL. TR_t referred to total revenue obtained from the sale of fibre or its products, also measured in SZL. L_t and D_t referred to cost of labour and cost of transport, respectively, measured in SZL. Labour was expressed as a function of time (hours) and wage rate (cost of labour per hour). IC_t referred to the intermediate consumption that all additional inputs used in wetland craft production, also measured in SZL. NP_t referred to the competitive return on capital expressed as a function of capital stock invested (K_t) and (i_t) the rate of investment (opportunity cost of capital or competitive rate of return on capital).

The households' levels of knowledge about threats endangering LW assessed the degree to which households were aware of the threats endangering LW. Therefore, the study assessed the degree to which households know about overexploitation of wetland resources, wetland drainage, wetland conversion, alien plants invasion, and wetland management. The respondents were asked to indicate (on a nominal 6-point Likert scale) their responses in accordance with set statements that LW was threatened by: overharvesting of fibre and medicinal plants, overgrazing, water withdrawal, alien plant invasion, agriculture near edges of LW, lack of wetland management and wetland policies. To assess the respondents' awareness of the benefits of conserving LW, they were asked questions soliciting their knowledge of the benefits of LW, if conserved: as being an alternative source of income, supply water for domestic and commercial purposes, flood control, and increasing or rather enhancing biodiversity (fauna and flora). Finally, to assess the attitudes toward conserving LW, they were asked to indicate their level of agreement that: harvesting should be controlled; uncontrolled livestock should not be allowed into or around LW; licences for water abstraction for commercial purposes should be issued; LW and streams are important for birds; conservation of streams and rivers is important; it is a waste of money and resources to conserve LW when people are poor and short of land; and people want to contribute to the conservation of LW.

Respondents were initially asked if they knew that LW was threatened in order to confirm that they had factual knowledge of the degradation of LW based on their observations. This was important because the reason the conservation project was implemented was because LW was

facing degradation, leading to welfare losses. They were also asked if they were aware of the conservation project and if it was beneficial to LW.

3.8 HOUSEHOLD CHARACTERISTICS OF THE SAMPLE

Table 3.2 summarises the socioeconomic characteristics of the sampled households.

Table 3.2: Demographic and socio-economic characteristics of respondents

Characteristic	Statistics
Total households	63
Gender:	
Male	19 (30.2%)
Female	44 (69.8%)
Average household size	8
Age structure:	
15-64 years	42 (66.7%)
65 years and above	21 (33.3%)
Marital status:	
Single	2 (3.2%)
Married	21 (33.3%)
Windowed	39 (61.9%)
Divorced	1 (1.6%)
Education level:	
None	11 (17.5%)
Adult education	2 (3.2%)
Primary	37 (58.7%)
Secondary	8 (12.7%)
High school	5 (7.9%)
Occupation:	
Wage employed	2 (3.2%)
Subsistence farmer	26 (41.3%)
Self employed	23 (36.5%)
Contract labour	4 (6.4%)
Pensioner	4 (6.4%
Disabled and unemployed	1 (1.6%)
Unemployed	3 (4.8%)
Average monthly income (in Emalangeni – SZL):	
Below 600	46 (73.0%)
Between 600–1,200	10 (15.9%)
Between 1,200-1,800	3 (4.8%)
Between 1,800-2,400	2 (3.2%)
Over 2,400	2 (3.2%)
Mean monthly income	619.41 SZL

Note: SZL is denotes Swaziland currency.
Source: Own data.

The observed gender distribution slightly under-represent males, about 70% of the household where headed by women. Subsistence farming and self-employment were reported as major

sectors of employment, with 26% and 23% of the entire sample, respectively. Some 73% of the respondents earned below 600 SZL per month, measured as combined household income.

3.9 EMPIRICAL STUDY MODELS

ANOVA (F-tests) and Chi-square tests models were used to verify the potential influence of socioeconomic moderators (income, age, gender and education) on respondents' knowledge and attitudes towards conservation of LW. The study employed an economic valuation model and resource rent model to estimate the economic value and resource rent of fibre respectively. These models were all run in STATA software, version 12.

3.9.1 ANOVA Model

The study used the one-way ANOVA model (an extension of a t-test) to verify the potential influence of continuous socioeconomic moderators (income and age) on respondents' knowledge and attitudes towards conservation of LW. This parametric model was selected because of its simplicity and because it satisfies two of its main assumptions: homogeneity of variance and random assignment. STATA runs the homogeneity of variance tests (Chi square test) automatically.

3.9.1.1 Model specification for the ANOVA model

The one-way ANOVA model uses the F-distribution which is an extension of the t-distribution; hence it is a ratio as shown in Table 3.3 below:

Table 3.3: ANOVA table

Source	SS	D.F.	Mean Square	F-Statistic
Explained	SS Between	J -1	SS Between / (J – 1)	MS Between / MS Within
Error (or Residual)	SS Within	N – 1	SS Within / (N – J)	
Total	SS Total	N - 1		

Source: Gujarati (2004).

Where:

SS – sum of squares
D.F. – degrees of freedom
J – number of explanatory variables
N – total number of observations
MS – mean of squares

3.9.2 Chi square test model

The study used the one-way Chi square model to verify the potential influence of categorical socioeconomic moderators (gender and education) on respondents' knowledge and attitudes towards conservation of LW. The model was run in STATA version 12 and also in Microsoft Excel where contingency tables were first computed.

3.9.2.1 Model specification for Chi square model

The Chi square model was specified and estimated as shown below:

$$x^2 = \frac{(\text{Observed-Expected})^2}{\text{Expected}}$$

Where:

x^2 - Chi square statistic

3.9.3 Economic valuation model

The economic 'market' valuation model was used to find the economic value of fibre provisioning ecosystem service at LW so as to enhance the policy relevance of this study regarding the importance of endangered wetland ecosystem services.

3.9.3.1 Model specification for economic valuation model

The economic value of fibre or rather revenue obtained from sale of raw fibre was estimated as a product of the quantity of fibre harvested and the price of raw fibre. The economic value of fibre provisioning ecosystem service was specified, as shown below:

$$Y_t = Q_t \times P_t$$

Where:

Y_t – Economic value of fibre

Q_t – Total annual number of bundles harvested in the last harvesting season (by species) from the sample

P_t - Prevailing market price of a bundle of raw fibre

3.9.4 Resource rent model

The resource rent model which is embedded in the concept of net price was employed to further enhance the policy relevance of this study regarding wetland use, management and conservation in trying to address property rights failures. It was chosen for its simplicity and minimal data requirements.

3.9.4.1 Model specification for resource rent model

The current resource rent of fibre was specified and estimated using the following formula (adapted and modified from Bostock, Cunningham, Neiland & Bennett, 2004; Mungatana, 2013):

$$RR_t = TR_t - L_t - D_t - IC_t \_ NP_t$$

$$NP_t = i_t K_t$$

Where:

RR_t	–	resource rent
TR_t	–	total revenue or economic value of fibre
L_t	–	cost of labour
D_t	–	cost of transport
IC_t	–	Intermediate consumption (inputs used in wetland craft production)
NP_t	–	competitive return on capital
K_t	–	fixed capital stock invested
i_t	–	the rate of investment (opportunity cost of capital or competitive rate of return on capital)

3.9.4.2 Estimating the resource rent model

To estimate the resource rent of fibre provisioning ecosystem service, the following steps were adopted:

1. Calculate the revenue obtained from the sale of a unit (bundle) of raw fibre.
2. Estimate all possible costs incurred in harvesting a unit of fibre and/or processing it.
3. Compute the resource rent of fibre as the difference between the total revenue and total costs.

3.10 CONCLUDING SUMMARY

This section outlined and discussed the methodological approach adopted in this study. Lawuba wetland is situated in the Middleveld ecological region, heartland of the Swazi nation. The study employed purposive sampling and simple random sampling techniques and a sample of 63 respondents were sampled and interviewed using a survey questionnaire. Data was coded in Microsoft Excel and analysed in STATA version 12. The study employed an economic 'market' valuation model, resource rent model, ANOVA model, and chi-square model for the analysis of data.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 INTRODUCTION

This chapter presents the results and discussion of the study and is organised into six sections: section 4.2 presents results and discussion for objective one, section 4.3 presents results and discussion for objective two, section 4.4 presents results and discussion for objective three and section 4.5 presents results and discussion for objective four. Finally section 4.6 summarises the results and discussion.

4.2 RESPONDENTS' FACTUAL KNOWLEDGE OF THE BENEFITS AND THREATS TO LW

4.2.1 Benefits of LW

The purpose of this section was to establish whether respondents factually knew about the benefits of conserving LW. To determine the respondents' knowledge, they were asked to indicate whether they were aware of the following benefits provided by LW: it is an alternative source of income and a supply of water for domestic and commercial purposes; a habitat for wildlife; it provides recreational, aesthetic and ecotourism benefits; it reduces and controls floods and enhances biodiversity (fauna and flora). Respondents were required to answer the questions using a six point Likert scale, with 6 indicating "strong agreement" with the statement, and 1 indicating "don't know". Results of this analysis are presented in Table 4.1 below where the aforementioned variables were used to capture the construct 'knowledge'.

Table 4.1: Respondents' knowledge of the benefits of conserving LW

Benefits	Strongly Agree (6)	Agree (5)	Not Sure (4)	Disagree (3)	Strongly Disagree (2)	Do Not Know (1)
LW provides an alternative source of income to local communities.	41 (65.08%)	20 (31.75%)	0 (0%)	2 (3.17%)	0 (0%)	0 (0%)
The ability of LW to control and reduce floods can be enhanced by its wetland plants.	38 (60.32%)	14 (22.22%)	4 (6.35%)	6 (9.52%)	0 (0%)	1 (1.59%)
LW provides water for domestic (drinking and cooking) and productive (irrigation and building) uses throughout the year.	30 (47.62%)	18 (28.57%)	4 (6.35%)	11 (17.46%)	0 (0%)	0 (0%)
Wetland plants and animals' population and species can be enhanced if LW is protected.	19 (30.16%)	39 (61.90%)	5 (7.94%)	0 (0%)	0 (0%)	0 (0%)
LW is a habitat (home/shelter) for wildlife like birds.	17 (26.98%)	37 (58.73%)	4 (6.35%)	3 (4.76%)	2 (3.17%)	0 (0%)
LW can be used for swimming, boating and for viewing its beauty.	1 (1.59%)	12 (19.05%)	0 (0%)	18 (28.57%)	32 (50.79%)	0 (0%)

Source: Author's elaboration.

The main conclusion that can be drawn from the sample results is that respondents have a high level of knowledge of the benefits of LW. However, there were comparably few respondents (only 1.59% strongly agreed) who were aware of the recreational or ecotourism and aesthetic values (swimming, boating and viewing its beauty) of LW. Recreational or ecotourism and aesthetic values are abstract in nature, hence the low level of awareness might be attributed to the level of education of the respondents, which is basic, at the primary level.

To further investigate the robustness of the sample results, Chi-square (x^2) and One-way Analysis of Variance (ANOVA) (an extension of independent samples t-tests) were used to verify the potential influence of some moderators (specifically the socioeconomic variables of gender, age, education and income) on variables used to capture this sub-objective. Chi-square (x^2) tests were used where both variables were categorical, while One-way ANOVA F-tests were used where one variable was categorical and the other continuous. The study collapsed levels in the categorical variables capturing knowledge about benefits on LW in

order to reduce occurrences of zero cells. Therefore, the 6-point Likert scale was reduced to a 4-point Likert scale, with 4 indicating "strong agreement" with the statement and 1 indicating "disagree". The magnitudes of the x^2 tests or F-tests, together with the p-values in brackets, are presented in Table 4.2 below.

Table 4.2: Influence of income, age, gender, and education on the respondents' knowledge of the benefits of conserving LW

Variable	Income	Gender	Age	Education
LW provides an alternative source of income to local communities.	12.670 (0.000)***	0.673 (0.714)	0.960 (0.390)	8.551 (0.382)
The ability of the LW to control and reduce floods can be enhanced by its wetland plants.	2.190 (0.082)*	3.673 (0.299)	0.680 (0.607)	10.720 (0.553)
LW provides water for domestic (drinking and cooking) and productive (irrigation and building) uses throughout the year.	0.250 (0.859)	3.271 (0.352)	2.190 (0.099)*	11.213 (0.511)
Wetland plants and animals' population and species can be enhanced if LW is protected.	1.150 (0.322)	2.364 (0.307)	1.420 (0.249)	6.530 (0.588)
LW is a habitat (home/shelter) for wildlife like birds.	0.150 (0.964)	3.389 (0.336)	1.490 (0.218)	12.196 (0.430)
LW can be used for swimming, boating and for viewing its beauty.	0.980 (0.409)	5.459 (0.065)*	1.330 (0.275)	6.243 (0.620)

Note: *, ** and *** denotes the statistical level of significance at 10%, 5% and 1%, respectively.
Source: Author's elaboration.

The results generally show that for questions used to capture this construct, households with lower income are more likely to be aware and knowledgeable about the benefits of LW. This relationship is significant at the 1% level for the variable "LW provides an alternative source of income to local communities" and at the 10% level for the variable "The ability of the LW to control and reduce floods can be enhanced by its wetland plants". The significant F value 12.67 tells us that at least two level effects differ from zero, for instance the means are not equal. However, it does not tell us where the differences are nor the direction of the relationship. To help identify these differences, the study further ran the Sidak, Bonferroni and Scheffe multiple comparison tests and the values were negative and significant. These tests apply corrections to the reported significance levels that take into account the fact that the multiple comparisons are being conducted. It is worth mentioning that these tests tend to be conservative, in the sense that they reduce the likelihood that you reject the null hypothesis when it is true (reduce the likelihood of Type I error). However, they increase the likelihood

of not rejecting the null hypothesis when the null is false (make Type II error more likely). The poorer you are, the more likely you are to be aware of LW as an alternative source of income and also to be aware of the flooding control function of LW. Households with low income are most likely to rely on wetland resources for their livelihoods. About a third (36.4%) of monthly household income was derived from the sale of fibre which is consistent with findings by Working for Wetlands (n.d.). In a recent study conducted in Uganda by Turyahabwe, Kakuru, Tweheyo and Tumusilime (2013), the study concluded that households with limited sources of livelihoods relied on wetlands for income for sustaining their livelihoods.

Generally, in almost all the variables gender does not seem to matter in this population: both males and females are equally likely to be aware of the benefits of LW except for only one variable “LW can be used for swimming, boating and for viewing its beauty”. Environmental educational campaigns do not discriminate according to gender: they target both sexes equally. It is thus not surprising that, overall, gender does not appear to have an influence on the knowledge of benefits of LW. In a similar study conducted by Mungatana and Ahimbisibwe (2012) in Uganda, results showed that gender did not appear to have influence on the knowledge of benefits of the Budongo Forest Reserve. However, in this study the relationship is only significant at the 10% level for the variable “LW can be used for swimming, boating and for viewing its beauty”, which suggests that females are more likely to be aware of the aesthetic and recreational values of LW. These results could be attributed to the fact that majority (about 69%) of respondents (household heads) were females.

Age has the expected sign but is statistically insignificant in general: it does not seem to have an influence on knowledge of the benefits of LW expect for only one variable “LW provides water for domestic (drinking and cooking) and productive (irrigation and building) uses throughout the year”. This relationship is only significant at the 10% level for the variable “LW provides water for domestic (drinking and cooking) and productive (irrigation and building) uses throughout the year”. The older you are, the more likely you are to be aware that LW provides water for domestic and productive uses. In a similar study conducted by Mungatana and Ahimbisibwe (2012), age did not seem to have an influence on the awareness of benefits of the Budongo Forest Reserve in Uganda generally, with an exception of only one variable, “climate regulation”.

Education does not seem to have an influence on knowledge of the benefits: it has the expected sign but is statically insignificant. Among other achievements, SEA has been successful in conducting public environmental awareness campaigns throughout the country which targeted all individuals irrespective of their education levels (SEA, 1997). These findings are consistent with other similar studies found in literature (for example, Mungatana & Ahimbisibwe, 2012). Mungatana and Ahimbisibwe (2012) found that education did not appear to have the expected awareness of the benefits of the Budongo Forest Reserve for questions designed to capture this construct at low levels of abstraction. Therefore, these results suggest that you do not require formal education to know about the benefits of LW; conceivably, environmental educational programmes were efficient in creating awareness on benefits of LW.

4.2.2 Threats to LW

The purpose of this section was to establish whether respondents factually knew the threats endangering LW. To determine respondents' knowledge of these threats, they were asked to indicate whether LW was threatened by: overharvesting of fibre, overharvesting of medicinal plants, overgrazing, water withdrawal, alien plant invasion, agriculture near its edges, lack of wetland management, and lack of wetland policies. Respondents were required to answer the question using a six point Likert scale, with 6 indicating "strong agreement" with the statement and 1 indicating "don't know". Results of this analysis are presented in Table 4.3 below, where the aforementioned variables were used to capture the construct 'knowledge'.

Table 4.3: Respondents' knowledge of threats endangering LW

Threats	Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree	Do Not Know
Lack of wetland policies that govern harvest of wetland resource threatens the sustainability (benefits to future generations) of the LW.	44 (69.84%)	16 (25.40%)	2 (3.17%)	1 (1.59%)	0 (0%)	0 (0%)
Overgrazing and livestock trampling in LW destroys wetland plants.	41 (65.08%)	19 (30.16%)	0 (0%)	2 (3.17%)	0 (0%)	1 (1.59%)
Overharvesting of medicinal plants from LW may lead to their extinction and in the long term, demise of the marshland.	33 (52.38%)	17 (26.98%)	4 (6.35%)	9 (14.29%)	0 (0%)	0 (0%)
Lack of wetland management in LW drives the threats mentioned above.	33 (52.38%)	24 (38.10%)	5 (7.94%)	1 (1.59%)	0 (0%)	0 (0%)
Overharvesting of fibre from LW may lead to its extinction and in the long term, demise of the marshland.	29 46.03(%)	12 (19.05%)	2 (3.17%)	16 (25.40%)	4 (6.35%)	0 (0%)
Agriculture (cultivation near edges of LW) may lead to water pollution through the use of fertilizers.	28 (44.44%)	11 (17.46%)	8 (12.70%)	11 (17.46%)	4 (6.35%)	1 (1.59%)
Water withdrawal from LW for domestic and productive uses may cause wetland drainage, if it is not controlled.	19 (30.16%)	12 (19.05%)	6 (9.52%)	23 (36.51%)	3 (4.76%)	0 (0%)
Invasive alien species in LW may out-compete important wetland plants like fibre, and also drain the wetland.	15 (23.81%)	28 (44.44%)	4 (6.35%)	15 (23.81%)	1 (1.59%)	0 (0%)

Source: Author's elaboration.

Based on the sample results, the study confidently concludes that the respondents are aware and know about threats endangering LW. However, there were relatively low responses reported for water withdrawal. In response to the statement "Water withdrawal from LW for domestic and productive uses may cause wetland drainage, if it is not controlled", 30.16% strongly agreed and 19.05% agreed with the statement. This implies that respondents were not aware that water withdrawal for both domestic and productive uses could potentially lead to wetland drainage. Acknowledging this ecosystem service as a potential threat (if overexploited) requires thorough understanding of the hydrology of wetlands which calls for education levels above the primary level. Since a majority of the respondents' education level is basic, primary level, this is in line with the study's expectation.

To further investigate the robustness of the sample results, Chi-square (x^2) and One-way Analysis of Variance (ANOVA) (an extension of independent samples t-tests) were used to verify the potential influence of some moderators (specifically the socioeconomic variables of gender, age, education and income) on variables used to capture this sub-objective. Chi-square (x^2) tests were used where both variables were categorical, while One-way ANOVA F-tests were used where one variable was categorical and the other numerical. The study collapsed levels in the categorical variables capturing knowledge of threats endangering LW in order to reduce occurrences of zero cells. Therefore, the 6-point Likert scale was reduced into a 4-point Likert scale with 4 indicating "strong agreement" with the statement and 1 indicating "disagree". The magnitudes of the x^2 tests or F-tests, together with the p-values in brackets are presented in Table 4.4 below.

Table 4.4: Influence of education, income, age and gender on the respondents' knowledge of the threats endangering LW

Variable	Education	Income	Age	Gender
Lack of wetland policies that govern harvest of wetland resource threatens the sustainability (benefits to future generations) of the LW.	21.514 (0.043)**	2.070 (0.114)	2.840 (0.046)**	1.713 (0.634)
Overgrazing and livestock trampling in LW destroys wetland plants.	38.474 (0.000)***	7.250 (0.000)***	2.150 (0.104)	1.738 (0.419)
Overharvesting of medicinal plants from LW may lead to their extinction and in the long term, demise of the marshland.	19.425 (0.079)*	3.120 (0.033)**	0.630 (0.597)	4.415 (0.220)
Lack of wetland management in LW drives the threats mentioned above.	16.704 (0.161)	2.270 (0.090)*	1.650 (0.189)	3.205 (0.361)
Overharvesting of fibre from LW may lead to its extinction and in the long term, demise of the marshland.	35.180 (0.004)***	1.190 (0.324)	2.200 (0.081)*	4.632 (0.201)
Agriculture (cultivation near edges of LW) may lead to water pollution through the use of fertilizers.	22.745 (0.301)	1.660 (0.159)	0.460 (0.807)	3.805 (0.283)
Water withdrawal from LW for domestic and productive uses may cause wetland drainage, if it is not controlled.	29.979 (0.018)**	0.420 (0.790)	1.140 (0.349)	9.233 (0.026)**
Invasive alien species in LW may out-compete important wetland plants like fibre, and also drain the wetland.	7.380 (0.965)	1.400 (0.247)	0.11 (0.978)	3.895 (0.273)

Note: *, ** and *** denotes the statistical level of significance at 10%, 5% and 1%, respectively.
Source: Author's elaboration.

The results show that generally across the questions used to this construct, the more you are educated the more likely you are to know about threats endangering LW. This relationship is

significant at the 1% level for the variables “Overgrazing and livestock trampling in LW destroys wetland plants” and “Overharvesting of fibre from LW may lead to its extinction and in the long term, demise of the marshland”; at the 5% level for the variables “Water withdrawal from LW for domestic and productive uses may cause wetland drainage, if it is not controlled”, and “Lack of wetland policies that govern harvest of wetland resource threatens the sustainability (benefits to future generations) of the LW”; and at the 10% level for the variable “Overharvesting of medicinal plants from LW may lead to their extinction and in the long term, demise of the marshland”. In a report compiled by SEA (2001:28), the wetlands in Swaziland were reported to be very susceptible to overgrazing and trampling by livestock, and overharvesting of fibre. Contrastingly with knowledge of benefits of LW, knowledge of threats endangering wetlands often require understanding about wetland functioning which can be attained by education levels above the basic level.

Income appears to have an influence on knowledge of threats endangering LW. The results suggest that households with lower levels of income are more likely to know about threats endangering LW. This relationship is significant at the 1% level, 5% level and 10% level of significance for the variables “Overgrazing and livestock trampling in LW destroys wetland plants”, “Overharvesting of medicinal plants from LW may lead to their extinction and in the long term, demise of the marshland” and “Lack of wetland management in LW drives the threats mentioned above”, respectively. These results are consistent with our prior expectation that the poorer you are, the more likely your reliance will be on natural resources as a source of income increases as means of sustaining your livelihood when you have limited alternative sources of livelihoods. Fibre contributes about 36% to household monthly income, hence it is more likely that a household would be aware of the prominent threats endangering LW as they may directly affect fibre harvests and hence reduce income, especially for poor households.

Age appears to have an influence on knowledge of threats endangering LW. As you grow older, you are more likely to know about the threats endangering LW. This relationship is significant at the 5% level and 10% level for the variables “Lack of wetland policies that govern harvest of wetland resource threatens the sustainability (benefits to future generations) of the LW” and “Overharvesting of fibre from LW may lead to its extinction and in the long term, demise of the marshland”, respectively. These relationships suggest that, for instance, as you grow older the more likely you are to know that the lack of wetland policies and

overharvesting of fibre threatens LW. In a similar recent study conducted by Damerell, Howe and Milner-Gulland (2013), increased age and longer community residence were found to increase the chance of the households' experiences and interactions with freshwater resources. It is thus not surprising that as you get older, you are more likely to be aware and knowledgeable about the threats endangering LW because of personal experiences and encounters with those threats as an older community resident.

In this studied population, gender does not seem to matter in almost all the variables: both males and females are equally likely to be aware of benefits of LW except for one variable "Water withdrawal from LW for domestic and productive uses may cause wetland drainage, if it is not controlled". This relationship is only significant at the 5% level for the variable "Water withdrawal from LW for domestic and productive uses may cause wetland drainage, if it is not controlled". These results could be attributed to the fact that about 69.8% of the respondents were female, hence these results are consistent with findings by Hlophe (2011) and Perlis (2012), which suggest women's contribution towards conservation of LW.

4.3 RESPONDENTS' ATTITUDES TOWARDS THE CONSERVATION OF LW

The purpose of this section was to determine the respondents' attitudes towards the conservation of LW. In the first objective, based on the sample results, the study established that the respondents factually knew about the benefits and threats endangering LW. Since the respondents have the correct factual knowledge about the benefits of and threats to LW, the study has the basis for asking questions soliciting their attitudes towards conservation of LW. Therefore, to assess the respondents' attitudes, they were asked to indicate if they agreed with the following statements: harvesting should be controlled; uncontrolled livestock should not be allowed into or around LW; licences for water abstraction for commercial purposes should be issued; LW and streams are important for birds; conservation of streams and rivers is important; it is a waste of money and resources to conserve LW when people are poor and short of land; and people want to contribute to the conservation of LW. Respondents were required to answer the question using a six point Likert scale, with 6 indicating "strong agreement" with the statement and 1 indicating "don't know". Results of this analysis are presented in Table 4.5 below, where the aforementioned variables were used to capture the construct 'attitude'.

Table 4.5: Respondents' attitudes towards the conservation of LW

Variable	Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree	Do Not Know
You want to contribute in some way to the conservation of LW.	43 (68.25%)	17 (26.98%)	3 (4.76%)	0 (0%)	0 (0%)	0 (0%)
Harvesting of fibre from LW should be controlled.	42 (66.67%)	13 (20.63%)	0 (0%)	5 (7.94%)	3 (7.94%)	0 (0%)
It is not good to allow uncontrolled livestock grazing around LW.	40 (63.49%)	20 (31.75%)	0 (0%)	2 (3.17%)	1 (1.59%)	0 (0%)
Licences for withdrawing water for irrigation or other commercial purposes from LW should be issued.	26 (41.27%)	21 (33.33%)	4 (6.35%)	9 (14.29%)	3 (4.76%)	0 (0%)
LW and streams in this region are important for birds.	19 (30.16%)	39 (61.90%)	5 (7.94%)	0 (0%)	0 (0%)	0 (0%)
To conserve different kinds of wildlife in LW, conservation of streams and rivers is important.	14 (22.22%)	45 (71.43%)	4 (6.35%)	0 (0%)	0 (0%)	0 (0%)
It is waste of money and resources to conserve Lawuba wetland when people are poor and are short of land.	10 (15.87%)	1 (1.59%)	0 (0%)	6 (9.52%)	45 (71.43%)	1 (1.59%)
There is scarcity of lands to produce enough food, therefore people should be allowed to farm in place of LW.	3 (4.76%)	1 (1.59%)	0 (0%)	10 (15.87%)	49 (77.78%)	0 (0%)

Source: Author's elaboration.

Based on the sample results the study established that the respondents have adequate factual knowledge about the benefits of LW and knowledge about the threats endangering LW. Accordingly, the study confidently concludes that the respondents have positive attitudes towards conservation of LW.

To further investigate the robustness of the sample results, Chi-square (x^2) and One-way Analysis of Variance (ANOVA) (an extension of independent samples t-tests) were used to verify the potential influence of some moderators (specifically the socioeconomic variables of gender, age, education and income) on variables used to capture this sub-objective. Chi-square (x^2) tests were used where both variables were categorical, while One-way ANOVA F-tests were used where one variable was categorical and the other numerical. The study collapsed levels in the categorical variables capturing knowledge of benefits on LW in order

to reduce occurrences of zero cells. Therefore, the 6-point Likert scale was reduced to a 4-point Likert scale with 4 indicating "strong agreement" with the statement and 1 indicating "disagree". The magnitudes of the x^2 tests or F-tests, together with the p-values in brackets are presented in Table 4.6 below.

Table 4.6: Influence of income, age, gender, and education on the respondents' attitudes on the conservation of LW

Variable	Income	Gender	Age	Education
You want to contribute in some way to the conservation of LW.	7.200 (0.002)***	1.418 (0.492)	0.150 (0.864)	6.809 (0.557)
Harvesting of fibre from LW should be controlled.	0.530 (0.661)	4.081 (0.130)	0.390 (0.793)	12.484 (0.408)
It is not good to allow uncontrolled livestock grazing around LW.	8.690 (0.000)***	3.299 (0.192)	0.110 (0.954)	5.859 (0.923)
There is scarcity of lands to produce enough food, therefore people should be allowed to farm in place of LW.	1.890 (0.142)	4.473 (0.107)	1.070 (0.371)	6.530 (0.887)
Licences for withdrawing water for irrigation or other commercial purposes from LW should be issued.	3.220 (0.019)**	3.716 (0.294)	1.970 (0.111)	11.659 (0.767)
LW and streams in this region are important for wildlife.	0.090 (0.918)	1.910 (0.385)	0.030 (0.967)	12.742 (0.121)
To conserve different kinds of wildlife in LW, conservation of streams and rivers is important.	13.320 (0.000)***	2.834 (0.243)	1.060 (0.352)	12.288 (0.139)
It is not a waste of money and resources to conserve LW even when people are poor and are short of land.	4.750 (0.002)***	11.854 (0.003)***	0.470 (0.755)	13.521 (0.634)

Note: *, ** and *** denote the statistical level of significance at 10%, 5% and 1%, respectively.
Source: Author's elaboration.

The results show that generally across all the questions used to capture this construct, households with lower income are more likely to have positive attitudes towards conserving LW. This relationship is significant at the 1% level for the variables "It is not good to allow uncontrolled livestock grazing around LW", "To conserve different kinds of wildlife in LW, conservation of streams and rivers is important", "You want to contribute in some way to the conservation of LW", and "It is not a waste of money and resources to conserve LW when people are poor and are short of land"; and at the 5% level for the variable "Licences for withdrawing water for irrigation or other commercial purposes from LW should be issued". These relationships imply that poorer households are more likely to have positive attitudes towards conservation of LW. These findings are consistent with other studies which established the relationships between the share of income, dependency on natural resources

and conservation attitudes (for example, Mironga, 2005). In the study conducted in Kenya by Mironga (2005), results established that income had a relationship with attitudes about the 'appropriate use and importance of wetland areas in Kisii district'.

In general, in almost all the variables, gender does not appear to have an influence on the respondents' attitudes towards conserving LW as expected, except for one variable "It is not a waste of money and resources to conserve LW even when people are poor and are short of land". This relationship is only significant at the 1% level for the variable "It is not a waste of money and resources to conserve LW even when people are poor and are short of land". This relationship suggests that females are more likely to have positive attitudes towards conserving LW compared to males. This could be attributed to fact that the males (30% of the respondents) earned more income compared to the majority (70%), females. Intuitively, households with lower income are more likely to have positive attitudes towards wetland conservation and depend highly on natural resources. These results complement other findings that have established that LW has been protected through women's efforts (Hlophe, 2011; Perlis, 2012). However, in the study conducted by Sah and Heinen (2001), results suggested that females had more negative attitudes about wetland conservation than males.

Age has the expected sign but is statistically insignificant: it does not seem to have an influence on the respondents' attitudes towards conserving LW. In the study conducted by Sah and Heinen (2001), age was found to insignificant for all the statements used to capture attitudes towards wetland conservation. It is thus not surprising that even in this study age does not seem to have an influence on households' attitudes towards conserving LW.

Across all the questions used to capture this construct, education does not appear to have an influence on the respondents' attitudes towards conserving LW. Education did not seem to have influence on the knowledge of benefits of LW, hence the study did not expect education to have an influence on the respondents' attitudes towards conservation of LW. Attitudes on wetland conservation depend on whether households receive tangible benefits from the wetland under conservation. From example, households receiving benefits from a conservation project are more likely to have, or rather express positive attitudes towards conservation (Sturdrod & Wegge, 1995). On the other hand, if the benefits are not equally distributed, regardless of the benefits, negative attitudes are frequently expressed (Parry & Campbell, 1992).

4.4 ECONOMIC VALUATION OF FIBRE PROVISIONING ECOSYSTEM SERVICEIN LAWUBA WETLAND (LW)

The second objective of the study was to estimate the annual economic value of fibre provisioning ecosystem service from LW. To estimate this value, the following steps were adopted:

1. Calculate the estimated total annual number of bundles harvested in the last harvesting season (by species) from the sample (Q).
2. Record the prevailing market price of a bundle of raw fibre (P).
3. Compute the economic value of fibre (Y) as the product of by Q and P. Y = Q * P.

The annual total number of bundles by species collected was computed from the sample (n=63). The annual collection of fibre at Lawuba lasted from April to October. Usually one harvesting season lasts from April to June. A total of 659 bundles of fibre were collected annually from LW. About 56.6% of the total annual harvest was sold. A household made approximately 4.2 trips to LW annually and about 2.5 bundles of fibre were harvested per trip. The number of household members involved in harvesting fibre was estimated to be 1.2. The average number of bundles harvested by each household annually was computed as a product of the approximate number of trips and number of bundles harvested per trip. Alternatively, the total number of bundles harvested annually (659 bundles) was divided by the sample (n=63). Both methods yielded the same answer, in which the mean number of bundles collected by each household was estimated to be approximately 10.5 bundles. The figure 10.5 was rounded up to 11 bundles to avoid biasness as the estimated economic value is already an underestimate. At the lower bound, the mean number of bundles was 8 (95% Lower Confidence Interval) while at the upper bound it was 12.9 (95% Upper Confidence Interval).

Table 4.7: Estimated harvests of fibre species in LW

Fibre Species	Used for own consumption (bundles)	Sold (bundles)	Total (bundles)
Cyperus latifolius (likhwane)	198 (69.2%)	252 (67.6%)	450 (68.3%)
Cyperus articulatus (inchoboza)	86 (30.1%)	115 (30.8%)	201 (30.5%)
Miscanthus capensis (umtsala)	2 (0.7%)	6 (1.6%)	8 (1.2%)
Total	286	373	659

Source: Author's elaboration.

In order to infer the estimated total quantity of fibre removed annually from LW, the average number of bundles harvested was then multiplied by the total number of households harvesting fibre from LW. At the time the study was conducted, about 253 households were reported to be harvesting fibre, hence approximately 2 783 bundles of fibre were harvested annually from LW. The fibre harvested from LW comprised the following species: *Cyperus latifolius* (likhwane), *Cyperus articulates* (inchoboza) and *Miscanthus capensis* (umtsala). Relatively small quantities of *Miscanthus capensis* (umtsala) (1.2%) were harvested compared to the other two species harvested, with *Cyperus latifolius* (likhwane) (68.3%) being the most harvested. *Miscanthus capensis* (umtsala) is notably scarce in LW while the other two fibre species are in abundance throughout the year.

In the second step, the market price of raw fibre per bundle was 100 SZL (US $10) at the time the study was conducted. Finally, the economic value was computed as a product of the total quantity of fibre harvested annually (2 783 bundles) by price per bundle of fibre. Therefore, LW fibre provisioning ecosystem service's worth was estimated to be likely between 202 893 SZL (US $20,310) and 326 400 SZL (US $32,673) per annum, which translates to US $70 per capita per annum.

4.5 RESOURCE RENT OF FIBRE PROVISIONING ECOSYSTEM SERVICE

The aim of the third objective of the study was to calculate the natural resource rent associated with harvesting fibre from LW. Three different notions of resource rent from the handcraft value chain were identified and estimated in this study. The first was resource rent associated with fibre harvested and used for own consumption at Lawuba (on site). The second was resource rent of fibre harvested and sold as a final product in Manzini (second stage in the value chain). Third was the resource rent of fibre manufactured at Lawuba, transported for 90 kilometres and sold in Manzini market.

4.5.1 Resource rent (RR1) of fibre used for own consumption at Lawuba

The following steps were adopted in calculating the resource rent of fibre: firstly, the revenue obtained from sale of a unit (bundle) of raw fibre was computed and secondly, the cost incurred in harvesting a unit of fibre was calculated and finally the difference between the total revenue and total costs was computed. Revenue was computed as a product of the local

price of raw fibre (P) and the quantity of fibre harvested from LW (Q). The local price of raw fibre recorded at the time the study was conducted was 50 SZL (US $5); hence, the revenue obtained from the sale of a bundle of raw fibre was 50 SZL (US $5).

Costs accounted for were only labour costs and competitive return on capital. It was fair to account for only these costs because indirect costs were embedded in competitive return on capital. On average, a household spent approximately 7.6 hours collecting fibre and harvested about 2.56 bundles per day or trip. Therefore, a household took about 3 hours to harvest a bundle of fibre on a normal basis. Households harvested the aforementioned fibre species by cutting stalks or stems at the base using a sickle. The stalks of fibre were then aligned so as form a bundle which is then tied by a rope, carried on women's heads and transported home (by foot).

In rural areas payments are in kind (not cash), especially in the very small and developing handicraft sector. Therefore, in attempt to accurately account for labour costs[4], the study converted the payments in kind into monetary terms. Households normally paid about 50 SZL per day for labour in cash. Alternatively, a bundle of fibre was used as payment in kind (token of appreciation) to pay for labour costs; this is equivalent to approximately 100 SZL (US $10) (market price). Since households harvested 2.56 bundles per day, the cost of labour for harvesting a bundle of fibre was about 39 SZL (US $4), after computation; this is equivalent to the price of a bundle of fibre (not the competitive market price) at Lawuba. The competitive return on capital (approximately 8.26 SZL) was computed as a product of capital (sickle and boots) and competitive rate of return on capital (0.055). The competitive rate of return to capital used in this study is within the range (5 to 10%) suggested by Scherzer and Sinner (2006:3). Therefore, the total cost of harvesting a bundle of fibre was approximately 47.31 SZL (US $4.74). According to Scherzer and Sinner (2006:3), costs associated with managing a resource are in fact attributable to the public, hence they are not relevant in determining resource rent.

The final step was to compute the difference between the revenue and total costs of harvesting a bundle of fibre. Therefore, the unit rent of fibre captured by household wetland users at the first level of the handcraft value chain was estimated to be 19.21 SZL (US $1.92).

[4]There minimum wage rate per day is about 32.85 SZL (657 SZL/20 days) for an unskilled worker in the handcraft industry in Swaziland (United State Department of State, 2012).

4.5.2 Resource rent (RR2) of fibre sold as a final product in Manzini

The following steps were adopted in calculating the resource rent of fibre as in RR1: firstly, the revenue obtained from sale of a unit (bundle) of raw fibre was computed and secondly, the cost incurred in harvesting and transporting a unit of fibre was calculated and finally the difference between the total revenue and total costs was computed. Revenue was computed as a product of the local price of raw fibre (P) and the quantity of fibre harvested from LW (Q). Fibre was sold at120 SZL (US $12) as a final product in Manzini, hence the revenue obtained from the sale of a bundle of raw fibre was 120 SZL (US $12). The general market price of a bundle of raw fibre was recorded as 100 SZL (US $10) at the time the study was conducted.

Costs accounted for were labour costs, competitive return on capital and transport costs. It was fair to account for only these costs because indirect costs were embedded in competitive return on capital. On average, a household spent approximately 7.6 hours collecting fibre and harvested about 2.56 bundles per day or trip. Therefore, a household took about 3 hours to harvest a bundle of fibre on a normal basis. Households harvested the aforementioned fibre species by cutting stalks or stems at the base using a sickle. The stalks of fibre were then aligned so as form a bundle which is then tied by a rope, carried on women's heads and transported home (by foot) where it would be stored. Households would collectively transport the raw bundles of fibre to be sold as final products in Manzini on a selected day.

In an attempt to accurately account for labour costs, the study converted the payments in kind into monetary terms. A bundle of fibre was used as payment in kind (token of appreciation) to pay for labour costs; this is equivalent to approximately 100 SZL (US $10) (market price). Since households harvested 2.56 bundles per day, the cost of labour for harvesting a bundle of fibre was about 39 SZL (US $4). The competitive return on capital (approximately 8.26 SZL) was computed as a product of capital (sickle and boots) and competitive rate of return on capital (0.055). Transport costs were estimated to be 50 SZL (US $5). Therefore, the total cost of harvesting a bundle of fibre was approximately 97.31 SZL (US $9.74).

The final step was to compute the difference between the revenue and total costs of harvesting a bundle of fibre. Therefore, the unit rent of fibre captured by household wetland users at the first level of the handcraft value chain was estimated to be 22.69 SZL (US $2.27).

4.5.3 Resource rent (RR3) of fibre products from LW sold at Manzini market

A similar procedure was adopted in computing resource rent where the three steps were followed as in computing RR1 and RR2. In the first step, the revenue part was calculated from the total revenue obtained from the sale of fibre products per bundle of raw fibre. A bundle of raw fibre produced between three and five mats, depending on sizes of the mats (small, medium or large). Therefore, the total revenue obtained per bundle of processed fibre was estimated to be approximately 480 SZL (US $48.05).

The second step involved accounting for all costs incurred from transforming raw fibre to final products at Lawuba and selling them at the Manzini market. Costs accounted for were: intermediate consumption, cost of labour, cost of transport, and competitive return on capital. Intermediate consumption involved all the direct costs of materials (raw fibre) used as inputs in the production of fibre products (mats). Household crafters from Lawuba purchased raw fibre as an intermediate product from other households harvesting fibre from LW and processed it into final products, and then transported it for about 90 kilometres to Manzini market. A household took about one week to process raw fibre into final fibre products on a normal basis. The fibre goes through a natural drying process where it is spread on flat ground with grasses. Once the fibre (stalks or leaves) has slightly dried up, noticed by change of colour to light brown, the required length is measured in preparation for weaving. A wooden loom or structure, locally called ‘imbongolo’ (which directly translates to a donkey that lugs the craft) with slots and weights from used-batteries tied by strings, was used for weaving. According to Zwane *et al.* (2011:776), this technology is appropriate, reduces fatigue for the crafter and increases production.

The cost of labour for processing the fibre was variable, depending on the size of the mats weaved. Therefore, an aggregate sum of processing a bundle of raw fibre was computed in relation to the size of mats produced and it was estimated to be about 130 SZL (US $13). The competitive return on capital (approximately 14.85 SZL) was computed as a product of capital (loom, strings, used batteries, dye, candles, and airtime) and competitive rate of return on capital. Since the fibre was processed at Lawuba and the products were sold at Manzini, transport costs were estimated to be about 100 SZL (US $10).

The final step was to compute the difference between the revenue and total costs of processing a bundle of fibre to sell to the final consumer at the Manzini market. Therefore, the unit rent of fibre captured by household crafters from Lawuba at the second level of the handcraft value chain was estimated to be 185.15 SZL (US $18.53).

4.5.4 Resource rents in handicraft value chain

In an attempt to establish if there is a pattern within the handicraft value chain hierarchy, the study used a student t-test to determine the differences between the aforementioned identified rents. Generally, there is an inherent pattern between the resource rents of fibre within the handicraft value chain that could be simply defined by increasing rents along the value chain (19.21 SZL - 22.69SZL – 185.15 SZL or US $1.92 - US $2.27 – US $ 18.53), as expected. However, it was not possible to determine if the value added to fibre (increasing rents) is statistically significant within the handicraft value chain owing to the difference in sample sizes of the three resource rents. A student t-test for equality of means between RR2 and RR3 showed that the rents were significantly different at 1% level of significance ($t_{4,\ 0.01} = -81.7058$; $\rho < 0.01$). The sample sizes ($n = 5$) were equal for RR2 and RR3 which made it possible to compare the rents. The difference could be attributed to the effects of value addition to raw materials. Adding value to raw fibre through processing increases the revenue obtained from the sale of the intermediate or final products.

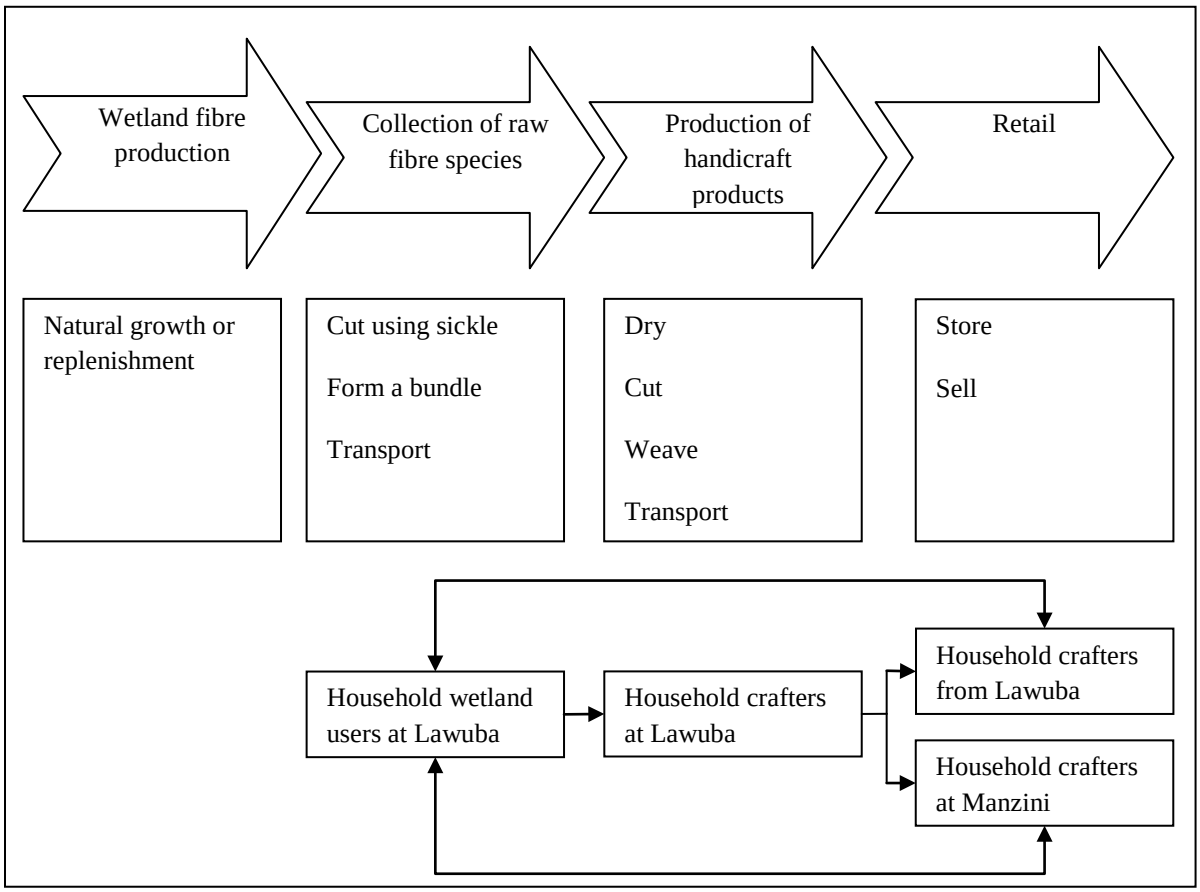

Figure 4.1: Potential value chain of handicraft production at Lawuba
Source: Author's elaboration.

Figure 4.1 above shows the potential handicraft value chain where processes, activities, and actors are mapped accordingly. The interaction between fibre provisioning ecosystem service and actors (fibre collectors, crafters) capturing rents from the identified notions of resource rents is demonstrated. Households collect fibre from LW and either use for own consumption or sale to crafters at Lawuba and/or Manzini. Local household crafters purchase raw fibre from household harvesters from Lawuba, processes it and sell final products at Manzini.

4.6 CONCLUDING SUMMARY

There are five conclusions that can be derived from this section. First, there is sufficient evidence to suggest that households at Lawuba have high levels of knowledge about the benefits and threats endangering LW. Second, households have positive attitudes towards conservation of LW. Income seemed to have an influence on all constructs (factual knowledge of benefits of LW and threats endangering LW, and attitudes towards conservation of LW). The conclusion that can be drawn from these findings is that contribution of wetland

resources (natural resource rent) to household income is imperative in being aware of the benefits of LW, knowledgeable about the threats endangering LW, and having a positive attitude towards conserving LW. There appears to a discerning pattern in the results in the sense that income has a strong influence on all constructs, while education appears to have a strong influence on factual knowledge on the threats endangering LW. Third, fibre provisioning ecosystem service has a positive economic value and confers important tangible benefits on households at Lawuba. Forth, there is ample evidence to suggest that the resource rent of fibre provisioning ecosystem service is positive under the current wetland access and management regime. Lastly, the identified notions of resource rent along the wetland handicraft value chain are all positive and seem to have an increasing trend.

The results demonstrate the appropriateness of using resource rent as a policy instrument for wetland conservation in combating wetland degradation. Respondents seem to attach a value to conservation of wetland ecosystem services. Since the resource rent is positive, institutions for capturing it could be developed through participatory approaches that maintain wetland ecosystem integrity and social welfare. Resource rent of fibre consumed on site (RR1) should not be taxed because of the socioeconomic status of the households at Lawuba. However, institutions should be put in place for preventing welfare loss at between 202 893 SZL (US $20,310) and 326 400 SZL (US $32,673) per annum. Positive attitudes towards conservation of LW imply that local wetland policies governing access and management of wetland resources could be developed with ease.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

The main objective of this study was to estimate the resource rent of fibre provisioning ecosystem service from LW. Specifically, it aimed at establishing the respondents' knowledge about benefits of LW, knowledge of threats endangering LW and hence their attitudes towards conservation of LW. To further investigate the robustness of the sample results, Chi-square (x^2) and One-way Analysis of Variance (ANOVA) (an extension of independent samples t-tests) were used to verify the potential influence of some moderators (specifically the socioeconomic variables of gender, age, education and income) on variables used to capture these constructs 'knowledge and attitudes'. The study also aimed at estimating the economic value of fibre provisioning ecosystem service and finally the resource rent. This chapter presents the conclusion, recommendations and policy implications, and limitations and areas for further research.

5.2 CONCLUSION OF THE STUDY

There is ample evidence to suggest that households in Lawuba have high levels of knowledge about benefits and threats endangering LW. They also have positive attitudes towards it conservation. Households' knowledge of the benefits of LW and attitudes towards its conservation were mainly influenced by income. Households with lower income had positive attitudes towards the conservation of the wetland compared with richer households. Generally, as you grow richer, you are most likely to have more diversified sources of income, which is likely to reduce your reliance on primary resources for income. Therefore, as you become richer, your reliance on natural resources as a source of income reduces. Poor households are most likely to attach a greater value to conservation of LW which has a limited resource base yet they are highly dependent on it for consumption. On the other hand households' knowledge of the threats endangering the wetland was mainly influenced by education. Knowledge about threats endangering wetlands often requires an understanding about wetland functioning which can be attained by education levels above the basic level.

LW fibre provisioning ecosystem service confers important tangible benefits to households at Lawuba and its value was estimated at between 202 893 SZL (US $20,310) and 326 400 SZL (US $32,673) per annum, which translates to US $70 per capita per annum. Results suggest that the resource rent of fibre provisioning ecosystem service is positive under the current wetland access and management regime. Magnitude of the resource rent increased along the value chain, as theory would predict. There are currently no institutions that exist for rent capture and appropriate re-investment to support sustainable wetland conservation.

5.3 RECOMMENDATIONS AND POLICY IMPLICATIONS

The study has observed a need to set up suitable resource management institutions and recommends that this be done. There is a need to develop appropriate institutions that capture resource rent to help attain optimal social welfare in the study area. However, the institutions should promote community livelihoods without depleting the natural resource base. Collection of rents from natural renewable resource could ensure the success of conservation projects and also ensure efficient management of the resource. The study proposes that households benefiting from a resource should reinvest a share of the resource rent back into the resource. A general rent extraction method could be employed so as to ensure allocative efficiency without destroying households' incentive to produce wetland products efficiently and for investing or reinvesting into LW for sustainable conservation purposes. The LW committee could use the collected rents for conservation activities to prevent further degradation of LW. Collection of resource rents could ensure returns to owners of the resource, achieve ethical objectives, and avoid inefficient allocation. Therefore, resource rent could be used as a regulatory tool to enforce property rights and control access to wetland resources for sustainable conservation purposes.

5.4 LIMITATIONS OF THE STUDY AND AREAS FOR FURTHER RESEARCH

The study was limited to fibre provisioning ecosystem service, and the economic value estimated is not the actual value of fibre in situ. In order to estimate the value of fibre in situ, the actual population of wetland plants must be determined. There is need to use methods from other fields (like Ecology) to determine the growth function of fibre, growth rate, harvest rate, and eventually compute the maximum sustainable yield (MSY). The study also

used the market interest rate to calculate the competitive return to capital which may have led to biasness in the calculation of resource rent. However, the effect of the biasness may not be significant when taking into account the fact the study used a proxy for the actual total quantity of fibre on site in computing resource rents. Robust wetland use, management and conservation policies can be made when the resilience of ecosystems is known, hence the need to carry out studies that determine the resilience of wetland ecosystems.

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APPENDIX A: LETTER OF CONSENT

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA
Faculty of Natural and
Agricultural Sciences

Informed consent for participation in an academic research study

Dept. of Agricultural Economics, Extension and Rural Development

ECONOMIC VALUATION AND NATURAL RESOURCE RENT AS TOOLS FOR WETLAND CONSERVATIONIN SWAZILAND: THE CASE OF LAWUBA WETLAND

Research conducted by:
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Dear Respondent

You are invited to participate in an academic research study conducted by Linda Siphiwo Mahlalela, a Masters student from the Department of Agricultural Economics, Extension and Rural Development at the University of Pretoria.

The purpose of the study is to determine the economic value and resource rent of fibre provisioning ecosystem service from the Lawuba wetland. The specific objectives are to: 1) estimate the economic value of fibre provisioning ecosystem service using the market price based method, 2) estimate the resource rent of fibre provisioning ecosystem service using the net price method, and 3) assess households' knowledge, attitudes and perceptions on wetland conservation.

Please note the following:

- This study involves an anonymous survey. Your name will not appear on the questionnaire and the answers you give will be treated as strictly confidential. You cannot be identified in person based on the answers you give.
- Your participation in this study is very important to us. You may, however, choose not to participate and you may also stop participating at any time without any negative consequences.
- Please answer the questions in the attached questionnaire as completely and honestly as possible. This should not take more than 30 minutes of your time.
- The results of the study will be used for academic purposes only and may be published in an academic journal. We will provide you with a summary of our findings on request.
- Please contact my supervisor, Dr. E.D. Mungatana at (+27) 12 420 3253 or email to: eric.mungatana@up.ac.zaif you have any questions or comments regarding the study.

Please sign the form to indicate that:

- You have read and understand the information provided above.
- You give your consent to participate in the study on a voluntary basis.

_____ _____

Respondent's signature **Date**

APPENDIX B: SURVEY INSTRUMENT

PART A. GENERAL INFORMATION

1. Constituency (Inkhundla).....
2. Village/Community.....
3. Geographic area.....
4. Name of Interviewer.....Date of Interview.....
5. Length of interview……..…minutes

PART B. DEMOGRAPHIC INFORMATION

6. Name of respondent (Optional).....
7. Please enter the details of household head in the following table.

Gender*		Age [Years]	Number of dependents	Marital Status*				Education level (a)	Primary source of income (b)
M	F			S	M	W	D		
1	2			1	2	3	4		

[1]Self employed refers to any other own business initiative apart from farming

* **M**= male **F**= female **S**= single **M**= married **W**= widowed **D**= divorced

Code (a) Education level
Illiterate=1 Adult Education=2 Primary=3 Secondary=4 High school=5
College/Vocational=6 University=7

Code (b) Primary source of income
Wage employed=1 Farmer=2 Self-employed[1]=3 Contract labourer=4
Pensioner=5 Disabled & unemployable=6 Unemployed=7 Other(specify).....

8. What is the total estimated household monthly income from all sources? E _____

PART C. HOUSEHOLD'S KNOWLEDGE, ATTITUDES AND PERCEPTIONS ON WETLAND CONSERVATION

This section seeks to find out your knowledge, attitudes and perceptions on degradation, conversion and conservation of wetlands in Swaziland together with the associated benefits and negative impacts of wetland conservation.

9. Kindly indicate your level of agreement with the following statements below about the benefits of conserving Lawuba wetland.

Benefits of conserving Lawuba Wetland	Strongly agree (6)	Agree (5)	Not sure (4)	Disagree (3)	Strongly disagree (2)	Do not know (1)
Lawuba wetland provides an alternative source of income to local communities						
Lawuba wetland provides water for domestic (drinking and cooking) and productive (irrigation and building) use throughout the year						
Lawuba wetland is a habitat (home/shelter) for wildlife like birds etc						
Lawuba wetland can be used for swimming, boating and for viewing its beauty						
The ability of the Lawuba wetland to control and reduce floods can be enhanced by its wetland plants						
Wetland plants and animals' population and species can be enhanced if Lawuba wetland is conserved						

10. As you may know, there are human actions that enhance the ability of the Lawuba wetland to provide benefits (actions that promote wetland conservation) and those that reduce it (actions that threaten wetlands). Please indicate your level of awareness of threats listed in the table below which could potentially threaten Lawuba wetland.

Threats	Strongly agree (6)	Agree (5)	Not sure (4)	Disagree (3)	Strongly disagree (2)	Do not know (1)
Overharvesting of fibre from Lawuba wetland may lead to its extinction and in the long term, demise of a marshland						
Overharvesting of medicinal plants from Lawuba wetland may lead to their extinction and in the long term, demise of a marshland						
Overgrazing and livestock trampling in Lawuba wetland destroy wetland plants						
Water withdrawal from Lawuba wetland for domestic and productive uses may cause wetland drainage, if it is not controlled						
Invasive alien species in Lawuba wetland may out competition important wetland plants like fibre and also drain the wetland						
Agriculture (cultivation near edges of Lawuba wetland) may lead to water pollution through the use of fertilizers						
Lack of wetland management in Lawuba wetland drives the threats mentioned above						
Lack of wetland policies that would govern the exploitation of wetland threatens the sustainability (benefits for future generations) of the Lawuba wetland						

11. Are you aware of the conservation programme in the Lawuba wetland? Yes [1] No [2]

12. If YES, in your own opinion, is the conservation programme beneficial to the Lawuba wetland? Yes [1] No [2]

13. If NO in question 11, I would like to brief you about the conservation programme. The conservation programme was implemented in 2011 in the Lawuba wetland by the Swaziland Government through the Swaziland Environment Authority (SEA) where local participation (from all wetland users) was expected for the execution of conservation activities. Therefore the local communities participated in the fencing of Lawuba wetland and formed a working committee in an endeavour to form an association of wetland users.

14. This question seeks to reveal attitudes towards the conservation of Lawuba wetland. Please indicate your level of agreement with the following statements.

Statement	Strongly agree (6)	Agree (5)	Not sure (4)	Disagree (3)	Strongly disagree (2)	Do not know (1)
Harvesting of fibre from Lawuba wetland should be controlled						
It is not good to allow uncontrolled livestock grazing around Lawuba wetland						
There is scarcity of lands to produce enough food, therefore people should be allowed to farm in place of Lawuba wetland						
Licences for withdrawing water for irrigation or other commercial purposes from Lawuba wetland should be issued						
Lawuba wetland and streams in this region are important for birds						
To conserve different kinds of wildlife in Lawuba wetland, conservation of streams and rivers is important						
It is waste of money and resources to conserve Lawuba wetland when people are poor and are short of land						
You want to contribute in some way to the conservation of Lawuba wetland						

PART D. FIBRE ECOSYSTEM SERVICE

This section seeks to find out the total quantity of fibre harvested from the last harvesting season. Fibre is usually harvested in bundles, which are head loads, once a year from around May to August. However, this varies with wetland types and their hydrology.

15. Did you harvest fibre in the last harvesting season? Yes [1] No [2]

16. If YES, kindly indicate by filling in the table below to the best you can recall.

Time of Harvest (in months)	**Number of Household members involved in the harvesting**	**Approximate number of trips**	**Number of bundles harvested per trip**	**Total number of bundles harvested**
May				
June				
July				
August				
Other (specify)				
TOTAL				*

17. Please indicate the number of bundles you used for own consumption and the number of bundles you sold for each fibre species to the best you can recall, from the total number of bundles (*) as stated in question 15.

Type of Fibre Harvested	**Number of bundles used for own consumption**	**Number of bundles sold**
Likhwane (*Cyperus spp*)		
Inchoboza (*Cyperus spp*)		
Umtsala		
Inchoshane		
Umuzi (*Isolepis spp*)		
Umhlanga (*Phragmites spp*)		
Other(specify)		

18. Please provide general comments on this interview.

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_____

PART E. DEBRIEFING

This part will help pinpoint specific problems in the questionnaire; as well confirm whether the questionnaire performed adequately in most cases.

19. In your own opinion, did the interviewee understand all the questions? Please rank the answers based on the level of understanding in the following table.

Level of understanding	Rank
Very well understood	
Well understood	
Understood	
Not understood	
Not well understood	
Not at all understood	

20. Were there any questions that the interviewee found hard to answer because the options given to choose from did not cover his/her opinion or how he/she felt? If so, please describe them. Yes [1] No [2]

_____

_____

_____

21. How would rate the reliability of the responses given by this interviewee? Please rank the reliability in the following table.

Level of understanding	Rank
Very reliable	
Quite reliable	
Reliable	
Not quite reliable	
Not reliable	
Not at all reliable	

22. Provide reasons for your response to reliability data question above.

_____

_____

_____

Thank you very much for your time and for participating in this survey!

APPENDIX C: LAWUBA WETLAND

Source: Author's elaboration.

APPENDIX D: PLATES OF FIBRE IN LW

Plate 1: Lawuba wetland fenced to avoid wetland grazing and a well dug and reserved for animals.

Plate 2: Cultivation at the edges of Lawuba wetland.