WILLINGNESS TO PAY FOR IMPROVED CONSERVATION OF WATER CATCHMENT IN HAI DISTRICT, TANZANIA

WILLINGNESS TO PAY FOR IMPROVED CONSERVATION OF WATER CATCHMENT IN HAI DISTRICT, TANZANIA

By

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A Dissertation Submitted in Partial Fulfillment of the Requirements for Award of the Degree of Master of Science in Project Planning and Management (MSc. PPM) of Mzumbe University.

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CERTIFICATION

We, the undersigned, certify that we have read and hereby recommend for acceptance by the Mzumbe University a dissertation entitled ***Willingness to Pay for Improved Conservation of Water Catchment in Hai District, Tanzania*** in partial fulfillment of the requirements for the award of the degree of Master of Science in Project Planning and Management of Mzumbe University.

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DEAN OF FACULTY OF SOCIAL SCIENCES

DECLARATION

I, Darra Sila N.**,** declare that this thesis is my own original work and that it has not been presented and will not be presented to any other university for a similar or any other degree award.

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DEDICATION

Being the effort of my beloved family (*Baba, Mama*, *Kaka, Dada*, *Watoto, Wapwa, Shemeji*) this work is dedicated to you all as a sign of love and thanksgiving to you for your inspirational and encouraging wards, moral and financial support coupled with unstoppable prayers and love.

ABBREVIATIONS AND ACRONYMS

CE	Choice Experiment
CM	Choice Modeling
CS	Consumer Surplus
CSU	Compensating Surplus
CV	Compensating Variation
CVM	Contingent Valuation Method
DUV	Direct Use Value
EPA	Environmental Protection Policy
ESU	Equivalent Surplus
EV	Equivalent Variation
FGD	Focus Group Discussion
GWA	Government of Western Australia
HPM	Hedonic Price Method
IUV	Indirect Use Value
NUV	Non-Use Value
OLS	Ordinary List Square
PES	Payment for Ecosystem Services
TCM	Travel Cost Methods
TEV	Total Economic Value
TSh	Tanzanian Shilling
URT	United Republic of Tanzania
WRM	Water Resource Management
VIF	Variance Inflation Factor
WTP	Willingness to Pay
SPSS	Statistical Package for Social Sciences

ABSTRACT

The water crisis is a real-time problem, which is attributable to poor management of water resources. Many people in rural areas in developing countries lack access to adequate water supply and sanitation, the efforts to solve it over the past three or four decades have produced disappointing results, accomplishing far less than had been expected. The cross-sectional study was conducted in Hai District, Kilimanjaro region Tanzania among 130 randomly sampled households. Data was collected using a self-administered structured questionnaire and both descriptive and inferential analysis were performed. 92.3% of respondents were aware of rules governing water catchment conservation. There was statistically significant influence (χ^2 =14.436 and p = 0.001) of respondent's primary occupation on awareness of rules governing water catchment in Hai District. The majority (70.2%) of the respondents showed positive perception about water catchment conservation, and most of them were willing to pay up to TSh. 100,000/-per month for conservation. The results of regression analysis revealed that respondent's willingness to pay for conservation of water catchment was significantly influenced by education level (p = 0.000), farm size (p = 0.001) and ward location (p = 0.025). The study concludes that collaborative water catchment management is an effective mechanism for water resource conservation. It ensures sustainability in water availability for different uses. In view of that, farmers should increase the rate of adopting improved technologies such as drip irrigation for efficient water use, which will reduce water loss and enhance water circulation.

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INTRODUCTION

1.1 Background of the study

Water resource is a vital component for human beings as it influences all other sectors of the economy in all aspects and ensures improved and sustainable community livelihood. According to World Bank (2018) Tanzania is the fourth most populous country in Sub Saharan Africa, with a population of more than 55.6 million people. The country's macroeconomic outlook is good, with a GDP growth of 6.5% per annum over 15 years and significant reductions in poverty since 2007 (World Bank, 2018). Despite this progress, 40% of population, lack access to quality drinking water (Esther & Ndalahwa 2002 and the World Bank 2018). However, the country recently fell a long way short of achieving Millennium Development Goal (MDG) targets for water and sanitation by 2015. Also, the Sustainable Development Goals (SDGs) appear to be even more daunting (Esther & Ndalahwa, 2002).

Water resources are inadequately managed in many parts of the world and many people, especially the poor ones and those living in rural areas in developing countries, lack access to adequate clean water supplies and sanitation (Nyongesa *et al.*, 2016). This is not a new problem as it has been acknowledged for a long time, yet the efforts to solve it over the past three or four decades have been unsatisfactory, accomplishing far less than had been anticipated and further create daunting on the new SDGs (Ebrahim, 2014; World Bank, 2018). Furthermore, in some circles, there is the view that economics may be part of the problem. There is a sense that economic concepts are inadequate to the task at hand, a feeling that water has value in ways that economics fails to account for and a concern that this could impede the formulation of effective approaches for solving the water crisis (Mlasi, 2013).

According to United Nations Development Programme (UNDP) (2017), Tanzania's shortcomings in the water and sanitation sector are somewhat surprising but now the country has the opportunity to revise and revitalize efforts to ensure that all Tanzanians live in a safe environment that bolsters their quality of life. Furthermore, improved conservation of water catchment will not only enhance water supply and sanitation but also SD and it plays a role in combating poverty (UNEP, 2011).

Consequently, the development of the ecosystem services concept was traced in the late 1970s and early 1980s with framing beneficial ecosystem functions as services to increase public interest in biological diversity conservation (Nyongesa *et al.,* 2016). Since then, the ecosystem service concept has gathered global interest whereas, following the release of two reports [Millennium Ecosystem (MEA) and biodiversity], there has been an increased contribution to the literature on ecosystem services (Fisher *et al.* 2009). As a result, the ecosystem service concept has been widely incorporated in socio-economic decision-making through increasing innovative market-based conservation tools including Payment for Ecosystem Service (PES) schemes (Ulimwengu & Prabuddha, 2011).

In Tanzania, the service of clean and safe water is still not very good as the majority of the populations are dissatisfied with the poor services of existing water supplies either in urban centres or in rural areas (Marandu, 2009). Before the formulation of the National Water Policy in 2002, catchment areas were managed by the regional administrations under the local government authorities. This management approach did not produce the expected results in the conservation of water catchments, partly because of institutional capacity and coordination mechanism, deforestation, uncontrolled bush fires, land degradation and unsustainable practices (UNDP 2017). The PES schemes have gained significant global attention as alternative approaches to improve environmental conservation and livelihood for sustainable production of ecosystem services in agro-ecosystem landscapes through alternative sustainable farming practices (Fisher *et al.,* 2009).

The Kilimanjaro region is among the regions in Tanzania in which a large proportion of the rural population relatively get their water supply with ease, both physically and financially, due to simplicity which exists in tapping clean water from streams or springs and conveying the same by gravity and other pumping energy (URT, 1998). The Kilimanjaro forest was protected by the local authority since before independence and later by the central government by declaring it as game reserve in 1910s, it was further proclaimed as a national park in 1973 and a World Heritage Site in 1987 (UNEP, 2011). Although the Kilimanjaro catchment area conservation has been progressively advocated by local national and international authorities, there is a worrying trend of water resources being depleted and their diminishing quality (Mattias, 2011)

According to Mattias (2011), the Kilimanjaro region, which falls within the Pangani basin is water-stressed, as about 50% of the basin is a semiarid and arid area with bimodal rainfall pattern whereby long rains occur in March–June and short rains in October - November. Rainfall patterns are largely related to altitude, with the highlands receiving about 1000mm - 2000mm, and the low lands receiving 500mm-600mm.

Knowledge and understanding of this essential water resource, its origin, amount and distribution can facilitate the management of a scheme that is beneficial for the majority of the inhabitants in the area (Killingtveit & Rohr, 2003). SDG 6, targets 1, 3, 5, 6 and 8 aspire to directly address the following issues by 2030:

- To achieve universal and equitable access to safe and affordable drinking water for all,
- To improve water quality by reducing pollution, eliminating dumping, and minimizing the release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally,
- To implement integrated water resources management at all levels, including through trans boundary cooperation as appropriate,

- To protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers, and lakes
- To support and strengthen the participation of local communities in improving water and sanitation management,

According to Andersson *et al*, (2006), the surface runoff comes from the glaciated peak of the mount that shows dramatic changes in water availability, affecting irrigation and hydroelectric power. The prospects indicate declining of precipitation and the glaciers on Mt. Kilimanjaro by 2015 - 2020 as identified in the precipitation records from the settled areas (Hemp, 2005) and may warrant the existing interest in research on conservation of water resource (Mattias, 2011). Water resources should be managed and conserved holistically and sustainably, respecting subsidiary and ensuing participation and treating the resource as an economic as well as a social good (World Bank, 2003).

Notwithstanding the above, politicians and some sections of the general public, especially in the developing countries have been trying to use these green fields for urban expansion, agriculture, construction, industrialization, mining, waste dredge disposal and human settlement among others (Kagunda, 2003). Moreover, the unsustained activities of the surrounding communities who mainly engage in crop farming, livestock farming, collection of logs for bricks burning among others, all threaten vegetated water catchments, wildlife habitats as well as water quality (Mayora, 2009). This has also been aggravated by Tanzania's increasing population which grows at a rate of 2.7 percent per annum (URT, 2013) implying the greater demand for food, other resources and supporting infrastructure. This has affected the trend of conservation of water catchments and general environmental quality.

Nevertheless, the literature on ecosystem service valuation and PES integration in policy are still limited in Africa and Tanzania in particular. PES schemes are generally direct payment incentives to ecosystem services (ES) based on the provision of services demanded by the community in order to conserve natural resources which are mainly

public goods and services prone to destruction through overuse (Zander *et al.*, 2013). Therefore, PES incentives encourage farmers to adopt sustainable farming practices in agricultural landscapes to internalize negative externalities for provision of ecosystem services (Pagiola *et al.*, 2007).

The UNDP in collaboration with GoT, is currently carrying out management intervention against land degradation to increase water quality and quantity by the year 2020. According to Bedru (2012) one of the key issues in designing and implementing is the market-based provision of environmental services through understanding of the demand of such service i.e., the willingness to pay of the beneficiaries for the environmental services. For environmental initiatives undertakings, particularly in developing countries, knowledge of the willingness to pay of potential beneficiaries for environmental services is extremely important for designing and implementing market-based methods.

Rural community farmers, especially those in Hai District, mostly depend on agroecosystems for economic development through farming activities. However, unsustainable farming practices lead to degradation of ecological health resulting in negative implication primarily soil erosion, flooding, pollution, and silt loading of the water ecosystems and to reverse ecosystem degradation trends, conservation livelihoods enhancement tools like PES have been initiated as an alternative for water catchment conservation through incentive mechanisms to farmers (Stephen, 2015; Nyongesa, 2011). This study, therefore, investigated community willingness to pay for improved water catchment conservation in Hai District of Kilimanjaro Region, Tanzania.

1.2 Problem Statement

Demand for safe and clean water by the households is asymmetrical and tentatively its demand and accessibility assures the household's health and productivity as it affects all activities for the life sustainability of the household. Therefore, a household significantly values the water resource, its availability in supply and quality, which depends highly on sustainable water catchment conservation (Mayora, 2009).

According to the Tanzania Water Policy 2002, water is a vulnerable resource as a result of the increase in the multi-sectoral demand of the rapidly growing population. The studies by (Stephen,2015; Dlamini, 2015; Siti *et al.,* 2016) reported that the ecosystem, especially at the slope of Mt. Kilimanjaro, is under high land-use pressure and subjected to the loss of biodiversity. To combat these hazardous situations, several interventions like the IUCN tropical forest program 1991, the African blackwood conservation project 1996, Africare program 2006 and the UNDP 2010 were carried out to protect and conserve the nature of Mt. Kilimanjaro forest and the region at large. Studies (UNDP, 2002; Mujwahuzi & Ngana, 2013; and Raphael, 2019) reveal that the ecosystem is facing great threats which are still overwhelming, therefore, effective intervention and research is needed.

Dlamini (2015) and, Chapika and Andreas (2009) reveal that PES was introduced and widely accepted among environmental conservation practitioners as a participatory approach to engage the community in conservation around the world. Its adoption in rural communities is relatively low and it is still a new ideology within the study area as well. The reasons drawn by Chapika and Andreas (2009) include low level of education, low interest on conservation activities, low community involvement in conservation programs, and low-income level. Factors such as distance from the household to the catchment and the ward location (whether lower stream or upper stream) were not accounted in their analysis and hence require more research.

Human activities such as farming and demand for construction materials and fuelwood made communities to forgo conservation activities hence, affecting water sources and causing water scarcity (Ndetewio *et al.,* 2016; Stephen, 2015). The WTP for the conservation of the ecosystem is affected by low adoption of PES as well, which needs clear study, Kadigi, and Mlasi, (2013).

Although there is a greater understanding of conservation and protection of biodiversity, little is known about community WTP for the conservation of water catchment. Similarly,

the influence of perceptions towards conservation programs and the awareness of rules and regulations governing conservation of catchment on WTP are also less understood.

1.3 Research Objectives

The following objectives were decided to guide the scientific investigation conducted in this study.

1.3.1 General objective

The study aims at assessing community willingness to pay for improved conservation of water catchment in Hai district.

1.3.2 Specific objectives

i. To assess community awareness of rules and regulations that govern catchment areas conservation.
ii. To examine perceptions of water catchment areas conservation.
iii. To determine factors that influence willingness to pay for improved water catchment areas conservation

1.4 Research Questions

i. Are communities aware of the rules governing conservation of water catchment areas?
ii. How do people perceive conservation of water catchment areas?
iii. What are the factors influencing willingness to pay for improved water catchment conservation in Hai District?

1.5 Significance of the Study

Investigation of community willingness to pay for improved water catchment conservation is paramount if we wish to succeed in protecting the environment and species from extinction for future generations. Findings of this study therefore, can be used to assist the responsible authorities i.e. the government, environmental conservation

practitioners and community at large in designing appropriate strategies to reduce human activities that threaten the survival of the water catchments and therefore produce a fundamental base for water regulatory authorities proficiently meet the escalating demand for water in the course of improving water circle and sustainable water supply. Similarly, this study supplements existing literature and lays a benchmark of reference to be used by similar research studies to be conducted elsewhere in the world.

1.6 Scope of the Study

The study was conducted in the Kilimanjaro Region of Tanzania in Hai District Council specifically in Rundugai and Masama Kati wards respectively. The confinement of the study was limited to only three specific objectives: to assess awareness of rules governing water catchment conservation, to examine perceptions of water catchment conservation and to determine factors influencing willingness to pay for improved water catchment conservation in Hai District. Methodologically, the study used descriptive analysis techniques such as cross-tabulation, calculation of frequency, percentage, minimum and maximum standards whereas, two inferential analysis, multiple linear regression model as well as a chi-square test of association were also computed to establish a relationship among variables.

Therefore, results of this study are presented in reference to the specific objectives mentioned herein and the data analysis patterns decided for each objective and results was summarized into tables and figures. Reference was drawn from different literature and studies conducted elsewhere in the world to better discuss the findings from the scope of other scholars in this particular field.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This section is a review of various literature on readiness to pay and pay for ecosystem services. The section also includes the defining of the main idea used in the research and theoretical and empirical research evaluation. The section also conceptualizes the research to present variables and their interactions within the context.

2.1 Definitions of key terms

2.1.1 Water resource

Water resources include all kinds of water, including groundwater, ponds, rivers, wetlands, drinking water, estuaries, coastal waters, and marine waters (EPA, 2012). According to (WRM Act, 2009), water resources are a course of water, surface water, groundwater, and estuary water; and may also mean (i) river, tributary, bay, lake, swamp, marsh or other wetland ; (ii) aquifer or spring ; (iii) seawater and freshwater interface (iv) dam, pond or reservoir.

2.1.2 Water catchment

The catchment is a categorized region in which the ordinary scene collects water. Rainwater running off in a catchment ultimately flows into a creek, river, dam, lake, sea, or groundwater system (Joanna *et al*., 2013). A catchment can also be described as a river or lake from which water flows to the designated receiver. It is also said that the boundary of catchments is a division that distinguishes water inflow into two distinct water structures, based on the water outlet type, and is differentiated by surface and underground catchments.

2.1.3 Sustainable water resource management

Sustainable management of water resources means managing the use, development and protection of water resources in a manner or at a rate that ensures the social, economic,

health and cultural well-being of people while safeguarding life-sustaining water ecosystem ability in the present as well as in the future. It requires looking at competing demands for water service and balancing the financial and social resources required for essential support on water systems (Tess *et al.*, 2014).

2.1.4 Community participation

This relates to an active process by which recipients affect the direction and execution of development initiatives rather than simply receiving a share of the project (Biswal, 2006). In many participatory approaches in developing nations, community involvement on conservation was directed at addressing crises. It was regarded as an ideological structure within which programs should be intended to satisfy both the demands of conservation and growth by involving local communities to a variety of extent, in the process of conservation of natural resources, or rather as a voluntary process through which individuals influence the choices that affect them (Hulme & Murphee, 2001).

2.1.5 Willingness to pay (WTP)

The word willingness to pay is defined by Agyemang (2016) as the maximum sum to be paid for products and services by a person or a country. The term WTP can be mystifying in non-economic aspects as one may not be willing to pay for a certain amount in cash so far are willing to pay such amount relatively than go devoid of. Furthermore, Agyemang (2016) said, in estimating WTP for any goods and services, three ways can be explored as commonly used and these involve revealed preference and stated preference techniques as follows;

i. Observe the price that people pay for goods in the various markets i.e. the water bill.
ii. Observe, among other things, individual spending on cash, time and labor to acquire such products by avoiding losses. This technique includes a coping

strategy assessment and includes observation, FGD concentrate and a household survey.

iii. Asking respondents what they are willing to offer as payments for ecosystem goods and services for future use. This includes the contingent Valuation methodology.

2.1.6 Water catchments vegetation

Catchment vegetation is vegetation intended for stormwater interception, runoff and soil erosion minimization. This vegetation decreases sediment and pollutants from runoff to neighboring lakes, wetlands, rivers, or streams (Matthew et al. 2006).

As it carries pollutants such as phosphorus, a nutrient used in fertilizer, soil particles accumulating as sediments in the above-described region interfere with aquatic life. These nutrients trigger excessive algae and aquatic plant development, water level oxygen depletion, and water quality degradation. Soil microbes and grass in buffer strips promote these pollutants' conversion and absorption, thereby protecting surface water resources (Minnesota Natural Resource Department, 2007).

Matthew *et al.* (2006) shows that, all vegetation types are important but from the considerable uncertain role of riparian vegetation and its relative efficacy. It seems that dense herbaceous and prairie is extra useful to trap particulates from water runoff, while forested flora is most effectual in nitrate filtration from the groundwater and maintain the organic matter in riparian soil which is needed for effective denitrification in groundwater.

According to GWA (2006) vegetation buffers along the estuaries, reservoirs, watercourses, wetlands, lakes, rivers, and production wells provide the following environmental benefits:

- A filter that helps to safeguard surface waters against pathogens, runoff enriched nutrients and spread of weed species through the water. Buffers are especially

significant downward gradients of erosive soil such as disturbed soil and unpaved roads.

- The slow movement of water in water bodies, enabling time for remedial action (oxidation) in case of chemical spills.
- Vegetation roots protect waterway banks from erosion and slow the progress of floodwaters.
- Provide a physical and visual barrier to limit unnecessary human and domestic animal access to sensitive waterways.
- It significantly influences the hydrological cycle.
- Support waterway ecology by shading water, supplying aquatic fauna with food and habitat, i.e. a natural source of leaf litter food and shelter supplied by fallen branches.
- Provide indigenous fauna corridors for home and migration.

Traditionally buffer vegetation is valuable as it slows down the surface runoff, reducing the rate of erosion, improving the water quality through denitrification and particulate removal from surface and groundwater. Vegetation forests provide good scenery for tourist activities as it provides a home for different fauna. The continuation of flora vegetation in riparian zone helps to sustain social needs and economic activities the rest of the community around Kilimanjaro and in Tanzania as a whole. This is done through effective conservation of the water resource which is a potential for agricultural and domestic activities as well as hydroelectric power production.

2.2 Theoretical Literature Review

2.2.1 Consumer Theory

The consumer theory was firstly introduced from Gossen's Law of consumer behavior in the year 1871. It was introduced to determine the impact generated by the observable behavior on demand of commodities at the market based on the best alternative assumption existing in reference to the budget constraint of an individual. The driving rule

in the theory is to maximize utility preferences under income restriction and price of such commodities to decide on consumption possibilities (Dannenberg, 2018).

The theory lies under a certain assumption that;

I. People are coherent and assumed to have preferences portrayed by multiple relationships.
II. There is the existence of a finite number of commodities based on location, quantity, and physical location from which consumer chooses to purchase.
III. There is a set of prices assigned to each bundle of products available at the market.
IV. People prefer the consumption of different bundles of commodities from the base of his or her budget line.

It is believed that an individual's behavior lies in cardinal and ordinal assumptions as proposed by Alfred Marsh, Allen, and Hicks, where they believed that the utility-driven consumption of commodities can be measured in monetary terms/utils through cardinal utility analysis. Again, this was criticized by ordinalist analysis of utility, which says that utility can not be measured (Dannenberg, 2018).

The consumer theory helps us to comprehend how individuals' tastes, preferences, and incomes influence the demand and as a result being the molding tool of the economy (Falk & Fischbacher, 2006). Under this theory we realize that consumers are consistent with their own preferences and have no homogeneity in maximizing utility in economic terms.

The theory of customer choice refers to usage consumption inclinations and buyer demand bends. It analyzes how buyers maximize the attractiveness of their use as measured by their inclinations subject to impediments to their uses by maximizing utility subject to a purchaser budget limit (Guagnano, 2001). Due to the involvement of two varied economic operators, use is offended from production reasonably. The vital individual is within the initial use of the case; in the present situation, a producer could create something that he could not spend on his own (Falk & Fischbacher, 2006). Various inspirations and

capabilities are therefore included. The models that make up the consumer hypothesis are used to talk to tentatively observable demand designs on the theory of compulsory optimization for an individual buyer. The critical valuation used to lighten up the rate at which cost of the product requested is relatively larger per unit than the costs of the related product and the customer's pay levels (Dannenberg, 2018).

Basing on the law of demand, the rate of consumption falls dramatically as the price of such goods or services rises, even when the consumer is financially well off. The effect of the higher price is realized, which is called the replacement effect. In this study this can be referred to as the willingness to pay for conservation of water catchments which diminishes as the minimum amount that people have to pay is relatively higher compared to their income levels (Andersson *et al.*, 2006). The theory further accentuates that as the amount of conservation of ecosystem rises, people will shun away from conservation and choose one of the alternatives. In this case, the alternative effects will be lethal for the conserved ecosystem (Nyongesa, 2011). In case there is no reward for the cost rise as it happens, at that point there will be a decrease purchasing power due to the cost rise leading to an additional decrease within the amount demanded. In this case the individuals will forego some of the preservation activities as they distort their wage level (Hope, 2006). In expansion, as the material resource of the individual rises, demand for more items realized. In this manner, it can be concluded that willingness to pay for conservation of water catchment zones is the effect of individual income levels (Hope, 2006).

In summary, the customer theory behavioral explanation suggested in this study is that all customers seek to maximize utility in sound behavior. Neoclassicals see in consumer theory that all buyers are looking to maximize a utility benefit subject to their limited budget. In other words, it can be accepted that buyers will select the best bundle of products they can carry at any point in their budget line. Consumer theory is therefore based on generating hypotheses about the nature of consumer demand from this behavioral hypothesize (Hanley *et al.*, 2007).

In line with the central hypothesis towards a valuable customer choice show, it is essential to create additional presumptions approximately the certain tendencies that consumers/society use when selecting their higher propensity conservation bundles are monetary for monthly payments (Hope, 2006). These are slightly strict, allowing the film to produce more useful theories about customer behavior than weaker presumptions, which would allow any experimental information to be clarified in terms of idiocy or some other measurements that it would subsequently be unable to produce any predictions of near-future requests. (Guagnano, 2001).

2.2.2 Theory of Welfare Change

The crucial underpinning of the theory of welfare change is propounded by economist Adam Smith in 1976 with two assumptions that there is an existence of an invisible hand idea. This helps to unfold the fundamental relationship of economic factors. The equilibrium is enforced by the behavior of factors to shift from low to high or from undesired to desired returns through allocation of economic resources that boost the wellbeing of an economic agent in any profitable activity. Concurring to Mitchell and Carson (1989), money-related values of characteristic stock are measured utilizing their impacts on human welfare. Subsequently, evaluating monetary values of characteristic or open items is an endeavor to measure the influence and/benefits these items bring to individual utilities.

Changes in natural or public goods can affect people's welfare in any of the four distinctive ways. Firstly, such changes can influence people through the costs they pay for the product within the market. Secondly, this can affect and cause changes in the cost that people pay for the factors of production. Thirdly, environmental changes can also influence people through changes in quality and quantities of other public goods. At last, alter in environmental goods can induce changes that may endanger people's livelihoods (Freeman, 2003).

The main concern about producer approaches is to award among the decisions of elective open asset allocation to advance social welfare. A more appropriate degree of welfare for agreement in the arrangement of open products or asset assignment is the use of changing Pareto, picking up one person without making any other person more unfortunate. The idea of a Pareto shift rests on the assumption that the expenses of that mediation should be exceeded in particular by the advantages of an open intercession. In this environment, the allocation of assets can achieve more remarkable productivity. According to Perman *et al.* (2003), the resource allocation is said to be productive on the off chance that it is not conceivable to create one or more superior individuals off without making off allocative efficiency more regrettable to the slightest another person. In addition, an assignment is wasteful in the event that it is conceivable to move one's welfare forward without anyone else declining. Therefore, the changing Pareto is not an appropriate condition, but an important condition for achieving allocative efficiency in environment product agreements: a state where no advances in aid are conceivable without decreasing one's welfare. Despite the reality that it is conceivable to address this problem by using a surrogate market for illustration, CS's accuracy is frequently troubled by the closeness of wage effect (Bennett and Blamey, 2001).

In addition, the elasticity of environmental or public goods is generally much greater than that of market products (Bateman *et al.,* 2002). Therefore, the measurement of the shift of welfare using CS can be undermined. It is therefore essential to use a more precise, unambiguous welfare measure. To tackle this ambiguity, as a refinement of the normal Marshallian demand features, Hicks (1943) created four alternative welfare policies. The use of the Hicksian welfare compensation measures accepts that the utility level of the consumer remains the same as the change in the supply of natural administrations for some time recently (Nicholson & Snyder, 2008). Defining the duality of the maximization problem refers to the use job given the standard request job. Therefore, an individual is anticipated to play down consumption, subject to a certain level of usefulness. Fathoming the problem of minimization leads to the Hicksian demand capabilities that appear to be

the quantities spent at distinct expenses expected to be balanced in order to keep the utility stable (Freeman, 2003).

The four elective welfare measures that are a typical CS modification are discussed as follows:

Variety Compensation (CV): this is defined according to price modifications at the introductory utility stage. Therefore, CV is a modification of an individual's wage needed to maintain him/her at the stage of introductory utility as, without the price, the biggest WTP decreases. Essentially, given a cost increase, CV is characterized as the sum of cash required by the buyer to keep him/her at the same utility level as with no cost increment, least of all readiness for recognition (WTA) (Markandya *et al*., 2002). CV inquiry is used when we try to settle some compensation plot at contemporary price levels, as CV uses a unique cost base.

Equivalent Variety (EV): EV is defined by price modifications at the contemporary utility stage. With a decrease in costs, EV is characterized as the extra pay to be given to the customer in order to convey him/her to the similar level of utility that he/she would achieve with the same wage in the event that the cost decreases, with the cost decreasing at least WTA. Essentially, with an increase in costs, EV is characterized as the sum of cash drawn from the buyer in order to achieve the utility that he/she would achieve with the current use in case there is an increase in costs. It measures the highest WTP of the individual to prevent the increase in costs (Markandya *et al*., 2002).

Compensation Surplus (CSU): CSU is defined by modifications in quality or quantity at the beginning of the utility stage. CSU is characterized for an enhancement as the sum of cash that should be deducted from the buyer's wage to maintain his utility level as without the most extreme WTP environmental change. Also, with debasement, CSU is defined as the amount of money to be provided to the buyer in order to maintain him/her faster reaction to the environmental damage at the same point of usefulness, least of all WTA.

Equivalent Surplus (ESU): ESU is defined by modifications in quality or quantity at the unused rate of utility. Having regard to enhancement, ESU is characterized as being the extra pay to be paid to the buyer in order to maintain him/her to the same utility level that he/she would achieve with the same salary given the normal advance, at the minimum WTA. In addition, with debasement, ESU is characterized as the sum of cash to be taken away from the buyer to bring him/her to the same level of usefulness that he/she would accomplish with the current wage in case the natural damage occurred, maximum WTP to dodge corruption (Markandya *et al.,* 2002).

2.3 Valuation of Environmental Services and Goods

It is expected by numerous individuals that natural products and administrations have no financial esteem since they cannot transact within the normal market. Be that as it may, a cluster of writing has stayed on this issue, affirming that it is conceivable to set up the economic value of the environmental products (Dlamini, 2015). Financial consideration may be a degree of the entire budget that an individual is prepared to forego other products in order to acquire other products at the market. A degree of welfare is usually conveyed as a willingness to pay. Thus, the cost accrued from the degradation of the environment is equal to the amount that people aspired to pay to replace the loss of environmental quality (Kadekodi, 2001).

Natural resource financial assessment includes evaluating society's inclinations with regard to public goods. It could be a procedure utilized to assign a monetary value to policy venture and program choices that come about (Bateman et al., 2002). Estimation of natural environmental goods has developed recently, due to the significant role of the government ineffective proper allocation of resources basing on the need demand and population distribution. Agreeing to Carlsson *et al*., (2003), vital conservation and feasible techniques for public assets and natural resources are legitimately tended to when financial values are recognized.

Most of the natural resources are public goods and are freely supplied and therefore the markets are lacking. Given that the market for environmental goods and services lacks, finances are mismanaged and inefficiently assigned due to values of unrevealed environmental products (Kadekodi, 2001). Due to an improperly regulated market price, inefficiencies may still occur at times when markets exist.

According to Haab & Mc Connell (2002), such kinds of ecosystem products are the main causes of community externalities and therefore cannot be assigned by markets themselves with invasive externalities or for where property rights are not obviously established. Therefore, it is essential to attach financial values to such public goods in solving externalities. Natural resource assessment shows the economic value or advantages that people derive for adequate management of their services.

Furthermore, according to neoclassical economic theory, market prices are insufficient for the value that society places on ecosystem services. If the value for these products established, then an individual will be more WTP or WTA for acquisition or compensation for damage to such a product. In regular markets, this value is apparent as the price paid for the goods, but with environmental goods and services, market imperfection distorts their real prices. Moreover, the value that individuals place on such product cannot be easily observed. (Carlsson *et al*., 2003).

The main concern of environmental valuation is to connect monetary values for non-marketed environmental products. Natural valuation is fundamentally based on the presumption that people are willing to pay for environmental advancements and on the other hand, are willing to acknowledge remuneration for an environmental deterioration (Hanley *et al*., 2007). Therefore, environmental valuation methods are divided into two main categories; revealed preference (indirect) and stated preference (direct) approaches.

The revealed preference approach involves the use of information from markets that are specifically related to the non-marketed value under consideration to infer value estimates.

It requires exploration of people's preferences as revealed by their actions in markets, which are significantly related to the non-marketed value of an environmental good or service under consideration. In this approach, we watch a genuine choice in a few markets and cleverly gather data on the trade-off between cash and the environmental products (Hanley *et al*., 2007; Bennett and Blamey, 2001). They incorporate travel cost strategy for assessing the utility value of recreational sites and hedonic estimating strategy which has been utilized to evaluate pollution costs (Bennett and Blamey, 2001).

Stated valuation inclination approaches to study the value of non-market products by using individuals in a theoretical expressed behavior. These strategies evoke natural values specifically from respondents by inquiring them approximately their inclinations for a given environmental value or benefit beneath thought (Alpizar *et al*., 2001). The most commonly used stated preference methods are the Contingent Valuation Method and the Choice Experiment Method (Hanley *et al.*, 2007).

2.4 Environmental goods and services valuation methods

In the valuation of environmental products, there are quite a number of economic techniques used. The Contingent Valuation Method (CVM) is widely used.

2.4.1 Contingent Valuation Method (CVM)

This is recognized as a declared preferential strategy and it is a non-market valuation technique used to value products from the public and the environment. It includes asking for the WTP or WTA a sample or population of concern (Hanley *et al.*, 2007). Recently, this technique has been used to determine the preferences of people due to the imperfect market for environmental goods (Paulo, 2009). Therefore, CVM tries to obtain non-market ecosystem valuation by directly asking participants for a change in environmental quality for their peak WTP or WTA (Carlsson *et al.*, 2003). The method is therefore contingent in the sense that on certain hypothetical scenarios WTP is contingently asked.

Often the CVM is the most commonly used method to assess the ecosystem services' use and non-use values. These approaches evoke natural values specifically by inquiring about their inclinations for a specified environmental benefit under thought. On the other hand, they ask how much they are prepared to acknowledge and to forego the current service they presently enjoy (Paulo, 2009). The method selection relies on the experiment context and the trade-off between the two methods' benefits and disadvantages.

The CVM challenges to measure comprehensively, because it was, the value of a good/ service by valuing the good in its entirety. Here, researchers are inquiring speculative questions to incite the amount they are arranged to pay for improving the quality of service they get. Paulo (2009) shows some of the CE method's benefits over the CVM. These include the capacity to assess environmental goods trait values. In terms of the possibilities of modeling substitution, the CE is superior to CVM in the context of recreational estimates. In terms of avoiding co-linearity among characteristics and being able to predict non-use values, the CE also has benefits over disclosed preferential methods. In recreation site decisions, these two techniques provide comparable preferential patterns. A CE criticism is that it uses characteristics to represent the condition of decision than to describe a particular shift of goal as does the CVM.

Due to the use of CE, Carlsson *et al*. (2003) also discussed some issues and mentioned that the CE is greatly challenging for respondents to the response. The article claims that throughout the experiment, preference may be volatile, incentive characteristics may be uncertain and experiment design is a challenging and complicated job. Foster and Mourato (2003) recommend that CE should be used to evaluate a single isolated change as component of a bigger set of change/policy, Stephens (2010) proposes that CE be used in cases anywhere the assessment of characteristics of a good or service is of specific interest.

Even though it has not yet occurred, the CVM also has an advantage in evaluating environmental change, making it useful as a policy-making advisory tool (Paulo, 2009). Use of sample surveys carefully designed and administered, the CVM was used to obtain

financial values of ecosystem services from people. In any case, the CVM has been an extraordinary subject of having a discussion; its depreciators contend that respondents, for the most part, allow answers that are conflicting with the standards of levelheaded choice since they do not get it what they are being asked to value and so the values shown are more than what they are inquired to value.

2.5 Review of Empirical Studies

The economic valuation in numerous studies that were conducted to determine factors that influence the WTP had hypothesized various factors to affect WTP for environmental conservation, but the value benefit of these variables depends on the type of environmental values being measured. For instance, the study by Wattage & Simon (2008) and Janet *et al*. (2007) revealed that amongst hypothesized factors, only the bid value and the expectation of future use value were significant where bid value establishes to have a negative coefficient to influence WTP.

According to Kagunda (2003), the community's readiness to pay for the conservation of Kenyan wetlands disclosed that local groups are WTP an annual sum of Ksh. 171 for the conservation of Naivasha Lake as they are conscious of its importance. Social-economic factors found to contribute negatively to wetland conservation. The study advises to encourage people and to integrate the traditional management program which takes into account the importance and the need to protect environmental biodiversity. The goal of the research was to explore the economic value of Naivasha Lake and how it could be preserved. The research used contingent valuation methodology based on the Pareto criterion to discover methods to place a currency value on private goods supply profits and losses. Primary data were gathered from randomly chosen participants using open and closely completed questionnaires. The regression model statistically analyzed data using the Stata and probit model to elicit WTP. The findings show that with a favorable coefficient, age size, educational level, revenue level, and family size have had a significant impact on WTP.

Bedru's (2012) research on the willingness to pay for reliable national water supply in Nairobi City disclosed that water shortage was Nairobi's biggest issue owing to the ongoing rise in water demand as population rises. This issue has been linked to human operations in the catchments of Susuna and thus impacts water quality. The goal of the research was to assess Nairobi residents' WTP for reliable national water supply through the conservation of catchments. Results indicate that social-economic variables count for household variability in WTP were education level, family income, and age size had a significant impact on WTP with a positive and negative coefficient. The research called for priority institutional and administrative effort to design market value based on the provision of environmental service. Data were gathered through contingent questionnaires survey, direct interviews and conversation of focus groups and used the Probit and Tobit model to solicit the WTP.

According to Wattage *et al*. (2008), the family income was insignificant to influence the WTP, because of a great variation of income among respondents contrary to the study by Prasher *et al*. (2006), Jeffand Thang (2007) and Janet *et al*. (2007) which realizes that the family income, distance from the catchment to residence, education level, age size and the awareness of importance of conserving wetlands significantly influence the WTP for conservation with positive coefficient.

Fussell (2011), discovered that down street customers are more prepared to pay higher for sound items and items that support and safe life fashion for others whether they are living or ordinance. The utility hypothesis was used to determine the WTP for products and profit from the constraint of the personal budget while the labor market hypothesis was used to determine maximum the WTP customers for living wages. Women discovered that they were more prepared to pay than males, where the level of education contrasted with what was expected to those surveyed with an elevated rate of education was less WTP for health products, but more WTP for extravagant products. The consideration's goal was to graduate WTP buyers with a price premium on the need for stuff moo cost and to lavish items that are capable of wage. Overview contemplate was performed by

using organized surveys questionnaires to collect data. To request the amount that consumers' willing to pay, CVM was used to solicit the WTP. Using simple linear regression and cross-tabulation analysis, the data gathered was analyzed. The research outcome demonstrates that there is an inverse relationship between education and product prices to influence the WTP. Thus, if the level of education of the participants is high and the product cost is high, there would be less WTP.

Akter (2007) used the CVM to collect farmers' WTP for irrigation water and to estimate the importance of irrigation water in Homna, a district in Bangladesh. The research used as the payment vehicle irrigation fees per decimal of ground area per crop season. Study results showed that the average WTP per season was U$27.83. The research further disclosed that WTP is considerably influenced by the variables age, level of education, family size, number of sources of income and farmland ownership.

According to (Everlyn, 2016) study on willingness to pay for watershed service by lower stream water user in Babati District reveals that, more than 50% of the water users were aware of importance of watershed and the average of 76.6 of water users were willing to pay for improved watershed services with mean value of Tsh. 56,791.5 per user/ annum. The study shows that social-economic factors such as income, gender, occupation, education and farm size significantly influence the WTP. The objectives of the study were to determine the WTP for improved watershed services by downstream water users. The cross-sectional survey was adopted, where both primary and secondary data were collected using structured questionnaires, direct interviews, and FGD. Data collected was analyzed using descriptive and inferential statistical analysis.

Mohammed (2009) estimated the benefits of Pine River water quality improvement in Thailand using the CVM to be in the range of US$1.25-3 million per year. The study revealed that the value of removing current riparian cropland from production to achieve improvements in river quality exceeds the value of those lands.

The study of Banda *et al*., (2006) on determinants of quality and quantity value of water for domestic users in the steel poor sub-Basin shows that the WTP is highly influenced by access to tap water, income, amount of water consumed per month, and water availability. The study employed contingent valuation methods to solicit the WTP for improved water availability. The Tobit model also was employed to analyze the factor affecting the WTP. The study shows the close relationship between observed social-economic factors and the amount of water consumed. The location also had a significant influence on the consumption of water and hence influences the WTP.

Gonzalez and Loomis (1997) used contingent valuation surveys of Puerto Rican households to estimate resident's WTP for preserving in-stream flows in the Mameyes and Fajardo Rivers. Results indicated that the annual base amount that the people were willing to pay was $11.33 million for the Meyers and $13.09 million for the Fajardo. Alam (2013) used CVM to measure respondents' willingness to contribute, both in the form of money and time, to restore an impaired river ecosystem in Dhaka City, Bangladesh. The results from the logistic regression analysis lend support to the hypothesis that a significant relationship exists between the resident's willingness to participate in restoring the river and their socio-economic and perception characteristics.

The study of Khan *et al.,* (2019) on the WTP for improved quality of drinking water in Pakistan revealed that the WTP for improved drinking water was significantly determined and influenced by a social-economic factor such as level of income, education, and public/ household awareness. The study collected data from randomly selected respondents through prepared questionnaires to a sample size of 150. Contingent valuation methodology, multinomial Logit, and linear regression were used to assess the WTP and the behavior of the household.

2.7 Conceptual Framework

The conceptual framework designed for this study comprises of different variables. In this note, respondents' characteristics such as education level, farm size, occupation, income

levels, and household size are conceptualized as variables influencing the likelihood of household's WTP for improved catchment conservation. For example, it is argued that the perceived benefit of conservation emanates from how educated a person is because education improves how people will value and appreciate their livelihood sustenance factor (See Mohammed, 2009). There is an increased acceptance of the fact that characteristics such as education, income levels, and household size has a lot to do with WTP for conservation. According to Chandra Sekaran *et al.* (2009), any attempt to quantify farmers' WTP to water services should at first solely study their characteristics including family labor force in this case household size, farm size, and income levels.

WTP is also a factor of how well off an individual perceives his financial resources. From the theory of welfare change, it is argued that the assessment of the economic values of environmental products is an attempt to determine the impact and/or benefits that these goods offer to people's utilities. Though the income levels of an individual specifically justify the number of ecosystem bundles that particular individual purchases. Similarly, in reference to consumer theory, how people decide to spend their money is solely given their preferences and budget constraints (Guagnano, 2001). In this case, it can be argued that the more the budget elasticity of an individual the more the increase in their WTP for water catchment conservation.

However, for these variables to be actually translated into a WTP it is again conceptualized that there must be positive interactions between the conservation program and their conservation activities and perceived benefits of conservation among people. Thus, when society is willing to pay for conservation activities, envisaged that they will be keen to participate in conservation activities, this will lead to sustainable management of water catchments and improves water supply for different uses including both domestic and agricultural purposes.

Figure 2.1 Conceptual Framework

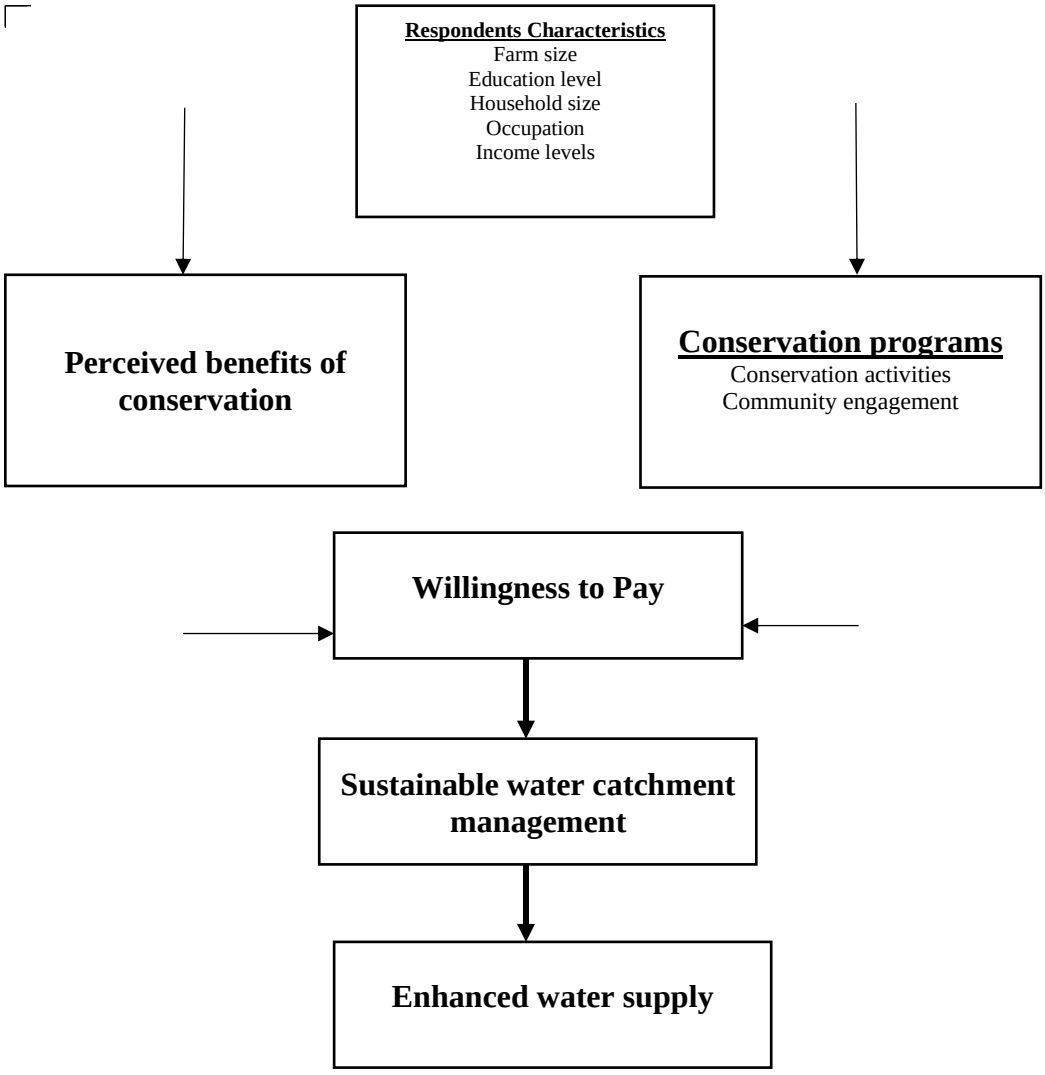


Figure 2.1: Conceptual framework

The logic behind the assumption of the conceptual framework of this study is the following:

Conservation of water catchment highly depends on the readiness of the people to pay the benefit drawn from consumption of such environmental goods and services. It is assumed that characteristics of the respondents have a positive effect on the readiness of people to pay for conservation of water catchment. Indicators like farm size and occupation of the respondents are assumed to influence the readiness to pay. Since most people engage themselves more in farming, activities need water and a friendly environment to achieve the objective in mind. Therefore, they are in a good position to stimulate conservation activities as they are more aware of the perceived benefit of conservation of water catchments. The education factor also seems to have a positive correlation and influence on conservation of water catchment as it is believed that, more educated people have exposure to the reviled benefit of the environmental goods and services and therefore they are ready to pay for conservation of water catchment. This assumption is held strong as literature and real situations reveal that people with low education level depend more on environmental goods and services with low knowledge of conservation which ends up depleting the nature and count for their less readiness to conserve. Household-level assumed to have inverse relationship with conservation activities. Where the household size is high the pressure exerted to environmental goods and services believed to increase dramatically hence over-exploitation of environment. Since the income level of household head or economic able household representative evenly distribute to the family basic needs, less amount will set aside for conservation activities and therefore count for low readiness to pay for environmental conservation when the household size is high. However, the assumption is that household size has a positive impact on the pervade benefit of the environment and hence their readiness to pay for conservation is high as they may involve themselves in conservation activities.

The general assumption here is, when all said above is observed, that respondents' characteristics appreciates the perceived benefit of the environmental goods and services and effectively participate in conservation activities stipulate that there is are great WTP

for conservation activities. When people's readiness to pay is high, there will be sustainable water catchment conservation and management which enhances water supply to the entire society/community.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This chapter presents how this work is carried out succesfully. It introduces the description of the study area, research design as well as sampling procedures and techniques used in this study. Similarly, sample size decided for the study, type of data and data collection tools are also well presented and lastly the data analysis plan and management techniques.

3.1 Study Area Description

This study was carried out in Hai District which is among the seven districts of Kilimanjaro region in Tanzania. To the south and west it borders the Arusha region and the Siha district respectively. To the east, it borders Moshi rural district, part of Moshi urban district and Rombo district. The western breach of Mount Kilimanjaro is also located in the district to the west. Administratively the District is divided into ten wards of which Masama Kati and Rundugai were sampled for this study. According to the 2012 National population census, Hai district was counted to have 210,533 people of which 48.7% were males and the rest were females (URT, 2013).

The District was purposively sampled for this study due to the presence of a big number of community-owned water users organizations than any other district in Kilimanjaro region. These include Losaa - KIA water supply trust, Uroki - Bomang'ombe water supply trust, Lyamungo - Umbwe water supply trust, Machame water supply trust and Mkalama water supply trust. In addition, community water organizations allocate TSh. 1,560,000 each year for planting trees on catchment areas. The District is also blessed to have a big number of rivers, streams, and man-made water furrows traditionally known as *Mofongo*. These are like Kikavu, Marire, Namwi, Sanya, Uvau, Ravashi rivers and other waster lodged areas like the Magadini area and Boloti swampy area. The demand for water for both domestic and farming activities is high in this area since the majority of its inhabitants

depend on agriculture activities. Thus, more than 80% of her inhabitants have access to clean safe drinking water as well as water for other uses including agriculture (Raphael, 2019). This makes Hai district ideal for this study.

3.2 Research Design

According to (Boadi, 2016) inquiries about plans could be arranged for conducting research which usually incorporates prerequisites of the essentials to be studied and the method to be utilized. It helps to seek data, analyze the prove of investigation and reply to the preparatory questions as transparently as possible.

A cross-sectional survey was employed in this study, where data collection was cramped to a single time period for each household or participant. This methodology has three distinguishing features: no time dimension; a reliance on existing differences rather than change following an intervention and groups were selected based on existing differences (Bourque, 2004). The cross-sectional study measure existing variation between respondent in the subject and hence explore the intact relationship of the outcome and the associated characteristic at one point in time (Bourque, 2004; Hall, 2008).

3.3 Sampling Frame

A sampling frame according to (Ishak and Abubakar, 2014) is defined as a listing of the inhabitant's unit from which the sample size is to be extracted at any phase of sampling. The sampling frame of this study was obtained from the ward population of 210 533 people according to the national census of 2012 (URT, 2013).

3.4 Sampling Techniques

The study uses non-probability and probability sampling techniques. Firstly, the purposive sampling technique was adopted in selecting Hai district among the remaining 6 districts of Kilimanjaro region basing on its level of water availability for different uses compared to the rest of the districts. The two wards were also purposively sampled based on their unique characteristics. For instance, Masama Kati ward is located upstream and the ward

receives enough rainfall unlike Masama Rundugai which is in the lower stream and receive a tiny amount of rainfall and therefore, suffers water shortage on yearly basis. Secondly, simple random sampling technique was used in selecting the households involved in this study in the two sampled wards. In each sampled household one respondent (either the household head, spouse or any representative of an ideal age) was selected.

3.5 Sample Size

A sample determination formula proposed by Kothari (2004) was used to generate a sample size used in this study.

$$n = \frac{z^2.p.q.N}{e^2(N-1)+z^2.p.q}$$

Where:

N= Population = 210533

n= estimated study ample size

e= error term = 5%

p= estimated proportion = 90%

Z= confidence interval = 1.96

Q= degree of accuracy

Therefore:

$$\mathrm{n} = \frac{1.96^2 * 0.9}{0.05^2(210533 - 1}$$

Based on the above calculations, the sample size decided for this study was approximated at 138 respondents. However, on the verge of time and fund constraints, a researcher took 130 of the derived number of respondents. This selection is justified by Bailey's (1994) assertion that 30 respondents irrespective of the population size are the bare minimum for a study in which statistical analysis is done. Whilst, in support of this Kumar (2005) holds that a sample size from 80-120 respondents is suitable for rigorous statistical analysis.

3.6 Types of Data

Only primary data was used in this study. According to Kothari (2004), primary data is first-hand data collected from the original source and analyzed purposely for the current research project.

3.7 Data Collection Tool

3.7.1 Survey questionnaire

Initial information was collected utilizing the organized survey containing both open and closed-ended questions. Closed-ended questions were utilized to guarantee consistency of reactions and are simple to code and agreeable to factual examination. Closed-ended questions were simple to reply as respondents were able to give answers rapidly due to the reality that the arrangement of alternative answers made a difference to create clear the meaning of the questions. On the other hand, open-ended questions such as "*others...please specify*" were utilized since they permit free reactions from the respondents, and allow them to enlighten, remark or quantify their response with no restriction to certain stated alternatives.

According to Kothari (2004), open-ended questions are complex to grip, understand, contrast and are subject to respondent bias. Therefore, consideration was paid to make the questionnaire more enlightening in the sense that it collects all essential information needed and the consistent of questions was maintained during its development. In conclusion, the survey was verbally managed by the researcher. According to Kumar

(2005) and Kothari (2004), verbally managed surveys are pertinent to provincial populations in countries where the majority of people is illiterate.

3.8 Description of the Study Variables

The study was constructed from a variety of variables. These include: operational variables and dependent as well as independent variables. These variables are described in Table 3.1. However, it should be noted that for the regression analysis, the amount that people were willing to pay for water catchment conservation (In Tanzania shillings) was regressed against the hypothesized factors (See equation 1). In this case, some of the operational variables were entered into the model equation as sovereign variables.

Table 3.1: Description of the study's variables

Background Variables	Operational definition	Measurement	Unit

Age	Number of years since birth	continuous	Years
Sex	Biological differences between male and female	Nominal	1 = Male 0 = Female
Marital status	A state of whether one has a spouse	Nominal	1=Single 2=Married 3=Divorced 4=Widowed
Household size	Number of people living under the same shade and shares part of meal	Continuous	Number
Education level	Number of years that one has spent in school	Continuous	Number
Occupation	One's legal activity for livelihood sustenance	Nominal	1=Farming/animal husbandry 2=Salaried employee 3=Petty business
Ward location	The geographical locality of the respondent	Nominal	1=Upstream (M/Kati) 0=Lower stream (Rundugai)
All Likert scale variables	All indicators of perception about conservation programs	Ordinal	1=Strong disagree 2=Disagree 3=Uncertain 4=Agree 5=Strong agree
Dependent Variable			
Willingness to Pay	The amount in Tsh that a respondent is willing to pay for conservation	continuous	Amount in Tshs
Awareness of conservation programs	State of knowledge about conservation programs	nominal	1=Aware 0=Unaware
Awareness of rules governing water catchment conservation	State of awareness of rules governing conservation of catchments	nominal	1=Aware 0=Unaware

Source: Survey Data, 2019

3.8 Data Processing and Analysis

Data entry was firstly done, followed by coding and editing before analysis to make them amenable to analysis. Statistical Package for Social Sciences (SPSS) computer software version 24 was employed to analyze data collected, where both descriptive and inferential analysis was performed. The descriptive analysis includes computation of frequencies, percentages, means, and standard deviations as well as maximum and minimum values. These were used to summarize data into an understandable and meaningful form.

The inferential analysis involved the use of Chi-square test association to institute the relationship that exists between some of the hypothesized variables and respondents' awareness of rules governing water catchment (First Objective). Secondly, a Likert scale of eleven Likert statements was used to quantify how respondents perceived water catchment conservation (Objective two). The Likert had five Likert gauges such as 5= strongly disagree, 4= disagree, 3= uncertain, 2= agree and 1= strongly agree, however, in order to bring meaningful results, and the gauge was merged into three as 3= disagree, 2= uncertain and 1= agree.

Lastly, multiple linear regression analysis model was used to determine factor influencing household WTP for the conservation of catchment (See equation 1 below).

$$Yi = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X4 + \beta_5 X_5 + \beta_6 X_{6+} \varepsilon \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

Where:

α	=	Intercept when all independent variables are equal to zero.
Yi	=	Household WTP amount (Tsh.)
X_1	=	Education level of respondent
X_2	=	Ward location
X_3	=	Distance from farm to the catchment area
X_4	=	Awareness of conservation program
X_5	=	Farm size
X_6	=	Household size
$\beta_1 - \beta_5$	=	slope coefficients
ε	=	Stochastic disturbance (Error term)

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.0 Introduction

This chapter presents the findings from the analyzed data and their discussion. First, it presents the description of the respondent profiles and their characteristics and then awareness of the rules that govern water catchment conservation results and their discussion. Moreover, quantification of respondent's perception about conservation of water catchment is well articulated in this chapter via a Likert scale. Lastly multiple linear regression results to determine influencing factors for WTP for water catchment conservation is presented in this chapter.

4.1 Respondent Profiles

4.1.1 Age

The average age was 44.45 years and the range was from 18 to 81 years. About 26.9% of the sampled respondents were within the age group of 26-35 years, while a slightly above quarter (25.4%) were between 36 and 45 years as compared to 24.6% who belong to the age group of 56 years and above. Just a few (15.4%) were between 46 and 55 years and 7.7% below 25 years.

4.1.2 Sex

The majority (62.3%) of the respondents were male compared to more than a quarter (37.7%) of their female counterparts. As can be observed that male respondents constituted a large portion of the entire sample size for this study, this was attributed to the fact that in most African cultures women are usually not allowed engaging with visitors unless there is prior permission from their spouse or a senior male member of the household. This has indeed diminished the chances of female respondents to be sampled for this study; similar allegation was reported in study about willingness to pay for ecosystem services conducted in Kilimanjaro, Tanzania and Taita Hills in Kenya (Stephen, 2015).

4.1.3 Marital status

Results, as presented in Table 4.1, indicate that the majority (76.9%) of the sampled respondents were married compared to very few (13.8%) single. Whilst 6.2% and 3.1% who were widowed and divorced respectively.

4.1.4 Household size

The mean size was 4.98 individuals per household ranging from 1 to 14 individuals. This finding tallies with an average size of 4.8 individuals per household in Tanzania as reported in the national population census document (URT, 2013). Whilst majority (68.5%) of the sampled households had 5 and below members, followed by 26.2% reported 6-10 members and quite few (5.4%) had 11 and above members.

4.1.5 Level of education

Education is an important variable in every aspect of human life. Its lack may lead to suffering in many social and environmental-related challenges. In reference to this study, education is envisaged to influence someone's WTP and acceptance to enacted bylaws to protect catchment areas. As can be observed in Table 4.1 about 42.3% of the sampled respondents had primary education, followed by 41.5% with secondary education. Similarly, quite few (11.5% and 4.6%) reported having post-secondary qualifications and no formal education respectively.

4.1.6 Main occupation

The majority (79.2%) of the sampled respondents were engaged in farming and animal husbandry compared to 12.3% reported to be salaried employees and 8.5% engaging in petty business. Occupation is an important variable as it determines income levels, it also correlates with the education level which is envisaged in this study to entail household WTP for conservation activities.

Table 4.1: Respondent's Profile

Variable	Categories	Frequency	Percent
Age	<25	10	7.7
	26-35	35	26.9
	35-45	33	25.4
	46-55	20	15.4
	56 &>	32	24.6
Sex	Male	81	62.3
	Female	49	37.7
Marital status	Single	18	13.8
	Married	100	76.9
	Divorced	4	3.1
	Widowed	8	6.2
Household size	<5	89	68.5
	6-10	34	26.2
	11&>	7	5.4
Education level	No formal education	6	4.6
	Primary	55	42.3
	Secondary	54	41.5
	Post-secondary	15	11.5
Main occupation	Farming/animal husbandry	103	79.2
	Salaried employee	11	8.5
	Petty business	16	12.3

Source: Survey Data, 2019.

4.2 Awareness of Rules and Regulations for Water Catchment Conservation

A cross-tabulation method and Chi-square test of association were performed to establish the relationship between some hypothesized factors and respondent awareness of the rules and regulations designed to protect the catchment areas in Kilimanjaro, especially in the Hai District. Therefore, results indicate that the majority (92.3%) of the respondents involved in this study were aware of different rules established by the government authorities and community environmental clubs to governing conservation of catchment areas, whilst quite a few (7.7%) reported to be unaware. On a similar note, a Chi-square test of association discovered that there was no statistically significant influence (χ^2= 2.938) and ($p>0.05$) of education level of respondent on their awareness of conservation rules and laws. This result is contrary to that of the study conducted in lower Moshi about WTP for watershed services which found education to have statistically significant influence on awareness of conservation programs and different rules (Ndetewio *et al.*, 2013).

Similarly, it was observed that household size was not statistically significant influence (χ^2 =2.443) and $p>0.05$) on respondents' awareness of rules and regulation to succeed catchment areas conservation. Contrary to this finding a study by Zahabu *et al.* (2016) reported that the higher the household size the better the chances that a particular household is having in informing themselves of the different interventions and changes that are happening in their community. On the other hand, there was a statistically significant influence (χ^2= 14.436) and ($p< 0.05$) of the respondents' main occupation on their awareness of the rules that govern catchment area conservation. It should be noted that a majority of the respondent sampled for this study were farmers and a quite high number of them were depending on these catchment areas for water supply for their livestock and irrigating their crops so it is envisaged in this study that they must be aware of the rules. According to Agyemang (2016), most of Africa's rural communities are mainly farmers and rely on forests for provision of different goods such as water, herbs, wild animals and fruits and thus, since water is an important aspect of their livelihoods, they designed their rules even without having any supportive interventions.

Lastly, a Chi-square test of association discovered that there was a statistically significant influence (χ^2= 4.527 and p<0.05) of the ward location on awareness of rules to conserve the catchment areas. It should be noted that this study was conducted among sampled households in up and lower streams respectively. Therefore, the study envisioned that due to their proximity to the catchment areas respondents who are from the upstream must be much aware of the rules than their counterpart from lower streams. A similar assertion was reported in the study by (Sylvie, 2010).

Table 4.2: Awareness of rules governing catchment areas

		Aware		Unaware			
Variable	**Categories**	**n**	**%**	**n**	**%**	**χ^2**	**Sig.**
Education level	No formal education	5	4.2	1	10	2.939	0.401
	Primary	53	44.5	2	20		
	Secondary	47	39.5	6	60		
	Post-secondary	14	11.8	1	10		
Household size	<5	79	66.4	9	90	2.443	0.295
	6-10	33	27.7	1	10		
	11&>	7	5.9	0	0		
Age	<25	8	6.7	2	20	4.777	0.311
	26-35	30	25.2	4	40		
	36-45	31	26.1	2	20		
	46-55	20	16.8	0	0		
	56&>	30	25.2	2	20		
Occupation	Farming/Animal	96	80.7	6	60	14.436	0.001
	Salaried employee	7	5.9	4	40		
	Petty business	16	13.4	0	0		
Ward location	Up stream	81	68.1	10	100	4.527	0.003
	Lower stream	38	31.9	0	0		

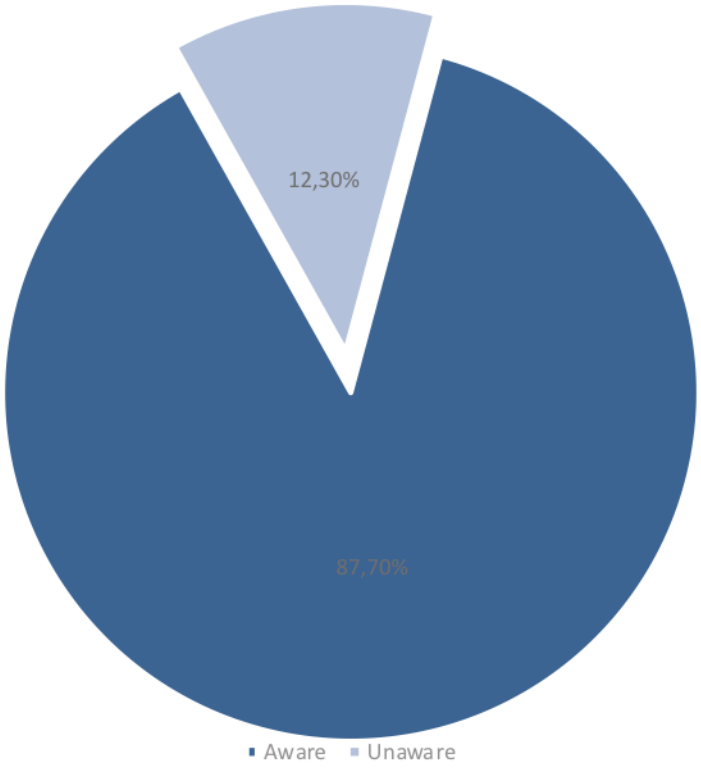
Source: Survey Data, 2019.

4.2.1 Awareness of conservation program

Again, respondents were asked if they are aware of any water catchment conservation program in their locality. Results indicate that the majority (87.7%) of the sampled

respondents were aware compared to few (12.3%) reported to be unaware. This result is similar to Stephen (2015) who also reported high awareness of conservation programs among residents surrounding Mount Kilimanjaro. (See Figure 4.1).

Figure 4.1: Awareness of water catchment conservation program



Source: Survey data 2019.

4.3 Perceptions of Water Catchment Conservation

A Likert scale of 11 statements was used to quantify the respondent's perceptions about water catchment conservation. The Likert scale had five gauges which were later on merged into three; they agree, uncertain and disagree and respondents were supposed to rate their perception in reference to these gauges. Results in Table 4.3 indicate that

majority (90.8%) of the sampled respondents agreed with the statement that conserving water catchment reduces soil erosion and improves water quality consecutively. In this reference, a study conducted in Uganda reports that reserved areas and environment at large provide many services that contribute to human wellbeing and poverty alleviation to people particularly those that live around them. However, highly dependance on services provided by these sites leads to degradation (Mayora, 2009).

The majority (86.2%) also agreed that conserving water catchments provides habitat for other wild fauna compared to very few (3.1%) who disagreed and 10.8% reported to be uncertain. Wetlands, on a global scale, have offered significant opportunities for tourism and recreation, providing economic benefits to the governments, the tourism industry and the local communities. The income has been used as a basis for their conservation though studies are acknowledging the water catchment conservation pressure because of the important role that they play inhabiting wild fauna (see for example Macharia *et al.*, 2010; Bikangaga *et al.*, 2007;Do *et al.*, 2015). On similar note, the majority (86.9%) agreed that water catchments are the source of natural herbs compared to just a few (3.1%) disagreed whilst, a good number (30%) disagree with statement that conserving water catchment reduces high risks associated with poor sanitation and 23.3% disagreed with statement that conserving water catchment improve recreational sites and sceneries.

Perception studies have been conducted in a global academic arena to establish whether attitudes and perceptions are the driving factors toward someone's WTP for ecosystem services. These studies have distributed conflicting results. Some studies suggest that the WTP for ecosystem services is highly reliant on the attitudes and perceptions of conservation (Kadigi & Mlasi, 2013; Mlasi, 2013; Pagiola, 2013). However, others view that the positive perception about the benefit of conserving ecosystem sources such as water catchment have for so long failed to be translated into the actual and committed WTP for conservation (Wunder, 2008; Ndetewio, 2013; Nyongesa, 2016)

Table 4.3: Perceptions about water catchment conservation

s/n	Statement	Disagree		Uncertain		Agree	
		n	%	n	%	N	%
1.	Conserving water catchment increases value of the farm	12	9.2	12	9.2	106	81.5
2.	Conserving water catchments improves water catchment and water quality	3	2.3	9	6.9	118	90.8
3.	Conserving water catchments reduces soil erosion	4	3.1	8	6.2	118	90.8

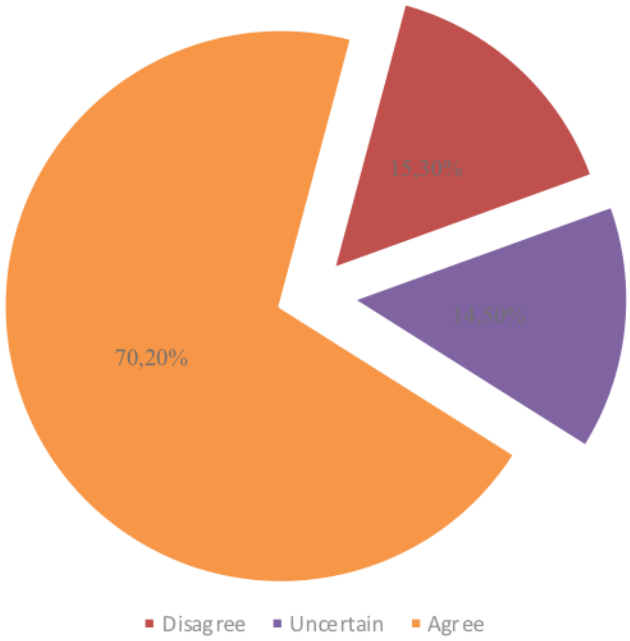
4.	Conserving water catchments reduces surface runoff and floods	15	11.5	34	26.2	81	62.3
5.	Conserving water catchment improve recreation sites and sceneries	31	23.8	34	26.2	65	50
6.	Conserving water catchments reduce high risks associated with poor sanitation e.g. diarrhea and cholera	39	30	23	17.7	68	52.3
7.	Conserving water catchment maintains shades at the streams/rivers, farm and reduces rates of direct evaporation	3	2.3	26	20	101	77.7
8.	Conserving catchments provides habitat for other wild fauna	4	3.1	14	10.8	112	86.2
9.	Water catchment are the sources of natural herbs	4	3.1	13	10	113	86.9
10.	Water catchment are sources of construction materials	10	77	25	19.2	95	73.1
11.	Water catchment are sources of fuel wood	8	6.2	14	10.8	108	83.1
	MeanScore (%)		**15.3**		**14.5**		**70.2**

Source: Survey Data 2019

4.3.1 Overall perception

As can be observed in Figure 4.2, the majority (70.2%) of the respondents agreed with the overall Likert statements as indicators of their perception. Whilst 14.5% were uncertain and 15.3% disagreed. From this finding it can be concluded that most of the respondents sampled for this study were having a positive perception about water catchment conservation. The high burden of environmental degradation in the developing countries is highly reliant to among other factors on poor attitudes and perceptions about conservation programs (Arild, 2010; Brendan *et al.*, 2010). Similarly, highly reliant on ecosystem goods among communities around conserved ecosystems has made people forgo conservation activities and interventions and thus, make it harder to translate positive perceptions and attitudes into actual conservation of ecosystems (Chapika and Andreas, 2009; Kisaka and Obi, 2015).

Figure 4.2: Overall perception of water catchment conservation



Source: Survey Data 2019.

4.4 Willingness to Pay for Conservation of Water Catchment Areas

Respondents were asked if they are willing to pay for water catchment conservation if payment for ecosystem services is introduced in the surveyed wards (Masama Kati and Rundugai). Among the 130 households, 91.5% (119 households) approved that they were willing to donate a certain amount of money for the water catchment conservation compared to 8.5% (11 households) who reported unwilling. On the other hand, the average amount that the household was willing to pay was Tsh. 19,013.45 ranging from Tsh. 500.00 to Tsh. 100,000.00. However, it should be noted that the average, minimum and maximum presented above were derived from the households who were willing to pay. To decrease non-response, reducing the final sample by removing protest zeros, unrealistic high values and other difficult reactions that can lead to efficient total response rates so low that the inhabitants of the study are fascinated and specifically taught quasi professionals (Sylvie, 2010). Therefore, following the acknowledgment of the complaint offered by the use of take-up after questioning, this research deleted the challenge provides for the examination of this region on the basis of the high overview response rate and the

reality that they constituted a very small amount with the diminished test not affected by its peculiarity. (See Table 4.4)

Table 4.4: Willingness to pay for water catchment conservation

	Willing		Unwilling	
Willingness status	**n**	**%**	**N**	**%**
	119	91.5	11	8.5
Amount (Tsh.)	**Mean**	**Minimum**		**Maximum**
	19013.45	500		100 000

Source: Survey Data 2019

4.4.1 Factors influencing WTP for water catchment conservation

The factors influencing the WTP were evaluated using a multiple linear regression model. The model was estimated to test the hypothesis about factors that affect the likelihood that a household was willing to pay for water catchment conservation. The WTP amount (in Tanzania shilling) was inserted in the model equation as the dependent variable and regressed against six independent variables (household size, education level of household head, ward position [whether located in up or lower stream], awareness of any conservation program and distance from water catchment to respondents' farms).

Regression results presented in Table 4.5 show the level of education of the respondent was highly significant ($p = 0.000$) and positively related to the WTP ($\beta = 0.299$). This implies that the WTP for water catchment conservation increases with the increased education level. This can be due to the fact that educated people could better understand there is a relationship between conservation and water availability and quality (Dlamini, 2015). Educated people may also better perceive the future risk of reduced water flows on

crop production and hence may understand the importance of payments as a tool to improve water catchment conservation (Ndetewio *et al.,* 2013).

Findings also revealed that there was a statistically significant ($p = 0.001$) influence of the farm size on the WTP for water catchment conservation. This implies that 1% increase in farm size owned leads to 0.012% (equivalent to 1.2) increase in the WTP. This suggests that farm size is an important factor that determines the decision to pay for water catchment conservation. These findings partly tally with those of Ma *et al.* (2012), a study that revealed that farmers' willingness to consider payment for ecosystem services chiefly depends on farm size. Farm size determines the levels of production and the resources that the farmers are devoting on their plot of land. Thus, WTP for conservation is also a factor of farm size among others (Chapika & Andreas, 2009).

The variable ward location (whether the award is located up or lower streams) was significant and positively correlated with the dependent variable ($\beta = 0.257$, $p = 0.025$). This implies that increase proximity to water catchment areas influences decision on households' WTP. This finding implies that 1% proximity to the water catchment area increases household WTP chances by 0.327%. In addition, it should be noted that water catchment areas are located in upstream villages and thus, households there were more willing to pay than their counterparts lower stream households. The reason counted to these was the high demand for environmental goods and services as evidenced by the positive perception of the respondents on conservation of water catchment. The majority of the lower stream respondents depend more on tape water for domestic and garden use contrary to respondents from upstream who depend on both tap and stream/river water.

Therefore, lower stream respondents do not see the importance of paying for the conservation of water catchment as it is in upstream respondents. These results are similar to those from a study done in Ethiopia, found that proximity to the area under conservation to be an important determinant of peoples' willingness to contribute to such environmental conservation initiatives (Mekonnen, 2000; Nyongesa *et al.,* 2016).

Household size and distance from the water catchment area to the farm, though positively correlated (β = 0.019 and 0.001) with the dependent variable were both found to have no statistically significant influence on households' WTP. Awareness of any conservation program was statistically insignificant (p = 0.191) and negatively correlated with households' WTP. Furthermore, these findings suggest that a 1% increase in ignorance/unawareness of conservation program decreases WTP by 18.4% (see Table 4.5 below)

Table 4.5: Regression results of factors influencing WTP

	β coefficient				
Independent variables	**Unstd.**	**Std.**	**Std. Error**	**t**	**Sig.**
Constant	3.036		0.248	12.247	0.000
Distance to catchment	0.001	0.085	0.001	1.179	0.241
Awareness of conservation	-0.184	-0.094	0.140	-1.317	0.191
Farm size	0.012	0.372	0.004	3.351	0.001
Education level	0.048	0.299	0.012	4.122	0.000
Household size	0.019	0.087	0.022	0.867	0.388
Ward location	0.327	0.256	0.144	2.274	0.025

Source: Survey Data 2019

4.4.2 Assessment of the Regression Model Fit

The adjusted R^2 value of 0.438 implies that 43.8% of the variations in the WTP for water catchment conservation in the Hai District were explained by the predictor variables in the model equation. Results also show that the F-value of 16.054 was highly (p = 0.000) which again, suggests that at least one predictor variable in the model significantly explains the change in the WTP.

Table 4.6: Evaluation of the model equation

Model	**Sum of squares**	**df**	**Mean Square**	**F**	**Sig.**

Regression	19.313	6	3.219		
Residual	22.056	110			
Total	41.369	116	0.201	16.054	0.000
R	**R-Square**	**Adjusted R-Square**		**Std Error of estimate**	
0.683	0.467	0.438		0.44778	

Source: Survey Data 2019.

4.4.3 Collinearity test of the model equation

The estimated model was tested for multicollinearity, which assesses whether or not independent variables have a strong relationship. Multicollinearity exists when the autonomous variables are strongly correlated ($r > 0.9$).

Testing the multicollinearity equation was carried out using the tolerance test and the Variance Inflation Factor (VIF) test built into each independent variable's regression. Hence, the greater the independent variables' inter-correlation, the more tolerance approaches zero, thus suggesting multicollinearity. Table 4.7 output shows that tolerance values for independent variables did not approach zero and VIF values were below 10, which indicates that there was no severe multicollinearity (Pallant, 2011; Gujarat, 2004).

Table 4.7: Collinearity test of the model equation

Predictors	**Collinearity test**

	Tolerance	VIF
Distance to catchment	0.941	1.063
Awareness of conservation	0.957	1.045
Farm size	0.393	2.546
Education level of Hh	0.919	1.088
Household size	0.485	2.063
Ward location	0.379	2.639

Source: Survey Data 2019.

4.4.4 Heteroscedasticity test of the model equation

The model equation was also subjected to heteroscedasticity test to establish whether the homoscedasticity assumption of the model was violated. Heteroscedasticity means unequal scatter in regression analysis in the context of the residuals or error term (Marwa, 2016). According to Gujarati, (2004) the term refers to the state in which the variation of a variable is irregular crossways the choice of values of a subsequent variable that predicts. One of the assumptions of the OLS is the uniform of variance of the residuals, if the variance of the residuals is non-constant then the residual variance is believed to be heteroskedastic (Gelfand, 2013). Therefore, in order to satisfy the assumptions of the model and be able to trust the results, the residuals should have a constant variance. According to Gujarat (2004), the unrelated regression equation of the variation of error term is tested by the use of the Breuch–Pagan test which tests the null hypothesis that the variance of the residual is all the same.

Table 4.8: Testing of Heteroscedasticity

Breusch - Pagan test/cook – Weisberg test for heteroscedasticity

Ho: Constant variable

Variables: the fitted value of log output

Chi^2 (1) = 1.27

Prob > chi^2 = 0.3261.

Source: Survey Data 2019

From table 4.8, the p-value of the chi^2 was found to be 0.3261 which is not significant at both 5% and 10% significance levels. If the value for prob Chi^2 is found to be insignificant it implies that there is no problem of heteroscedasticity in the data. Since our data showed prob of Chi^2 being insignificant then it means that there's no problem of heteroscedasticity.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

The overall objective of the study was to assess the WTP of communities for improved water catchments conservation in Hai District. Therefore, based on the findings the following conclusion and recommendations can be made.

5.1 Summary of the Key Findings

The majority (92.3%) were aware of the rules governing conservation of water catchment unlike very few (7.7%) who reported to be unaware. On a similar note, about 87.7% were aware of conservation program in Hai district when compared to 12.3% unaware. The majority (70.2%) had positive perception about water catchment conservation and less

than quarter (15.3%) had negative perception while 14.5% was having neither positive nor negative perception.

The majority (91.5%) of the sampled respondents showed a willingness to pay for conservation. The WTP amount ranges from Tsh. 500 to 100,000. Results of the regression analysis indicate that the WTP for conservation was influenced by farm size, education level of the respondent and the location of the ward (Weather upstream or lower stream).

5.1 Conclusion

The decline in water flows in streams and rivers is increasingly a common phenomenon and countless studies have attested to the fact that environmental degradation has been rampant in the catchment areas and buffer zones of river and stream banks also water sources in the catchment. The situation in the Hai district is not exceptional from the above generality. Collaborative water catchment management entails effective conservation and therefore, guarantees sustainability in water availability for different uses.

This study concludes that given the high levels of awareness among the sampled respondents of both rules/regulations governing water catchment conservation in the Hai District, plus, overrated positive perception about water catchment conservation and relatively peoples' WTP for catchment conservation in this study should be translated into robust initiatives to succeed conservation of water catchment in a sustainable way.

It should also be considered that payment for ecosystem services (PES) is just a mechanism for financial resource mobilization but this study is also concluding that the next crucial step should be the effective use of funds to resolve some of the problems and challenges related to water catchments such as environmental degradation, inefficient use of water and pollution.

5.2 Recommendations

Besides the symbiotic relationship between the ecosystem and the surrounding communities observed by this study in Hai district, still some people reported being unaware of the rules governing water catchments and unaware of any conservation program in their locality. Thus, some showed an unwillingness to pay for water catchment conservation; if this is still unchecked, the situation might escalate and increase pressure on water catchment areas.

This study, therefore, recommends the existing environmental programs, initiatives, and all responsible authorities to design and disseminate environmental education through public awareness campaigns and other available measures. This will succeed not only increasing awareness among communities but also empower them to translate this awareness and perceptions into the actual conservation water catchment and environment at large.

The study also recommends to farmers that they should increase their pace of adopting improved technologies for efficient water use such as drip irrigation which is slowly becoming a common taboo in Hai and several other districts in Tanzania. The use of technology should also be extended to the use of water flow dimension gadgets which are in an actual sense not existing among water users in the Hai District. This will indeed reduce water loss and allowing for return flows to the mainstream or river and therefore enhances water circulation.

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APPENDIX

Appendix 1: Household Survey Questionnaire

Hello, I am a student from Mzumbe University, currently doing research on Community willingness to pay for improving conservation of water catchments in Hai District, Ng'uni Village. The research I am carrying out aims at examining the concept of voluntary participation in conservation of water catchment as a way to improve water quality to suit the demand of growing population in Hai District. You have been selected to participate in this survey. Your readiness to spare a few minutes and respond to the questions in this questionnaire will be highly appreciated. All your answers will be treated with the utmost confidentiality.

I. General demographic information

1.Respondent Code	District	Ward	Date

2.Name of the respondent (Option) ……

3.A number of household members ……...

4.Age of respondent (in years):……..

5.Sex of respondent: (please tick (√) as appropriate)

Male	Female

6.Education level of household head (in years in schooling): ……

7.Marital status (please tick (√) as appropriate)

Single	Married/Cohabited	Divorced	Widowed

8. The main occupation in terms of significant contribution to household income(please tick (√) and show average income earned per month as appropriate)					
Agricultural activities(farming & livestock)	Employed in the public sector)	Employed in private sector	Self-employed in business	Tourist activities	Others (please name) ....
( ) Tsh.	( ) Tsh.	( ) Tsh.	( ) Tsh.	( ) Tsh.	( ) Tsh.
9.Are you a member or a leader of any societal group e.g VICOBA, environmental club?					
Yes				No	

II. Socio-economic profile of the household

1.Status of the house (please tick (√) as appropriate)	
Brick walled, Cement floor and corrugated iron roof	Brick walled with plaster, tiled floor, and corrugated iron roof

2.Do you own any land in this locality or elsewhere?	
Yes	No
3. If yes, what is the size of the land (in acre) ……	
4.How did you get this land? (please tick (√) as appropriate)	

Bought from private owners/**government**	Inherited	Others (please specify)

5. Do you have a Customary Certificate Right of Occupancy (CCRO) for this land?	
Yes	No
6. How much of this land did you cultivate last farming season? ……..	

7. Have you ever taken loan/credit from any financial institution (please tick (√) as appropriate)	
Yes	No
8. If yes did you pay any collateral?	
Yes	No

9. If answer 'yes' in Qn. 9, what is a kind of collateral? ……

III. Conservation of Water Catchments and Willingness to Pay

There are several motives for conserving water catchments. On a scale of 1 to 5, Please rate the benefits derived from conservation of water catchment by writing the number scale which corresponds to perceived benefits: -

1-Fully disagree; 2-Disagree; 3-Not sure; 4 – Agree; 5-Fully agree

S/n	Perceived Benefits	Please Rate scale by ticking (√) where appropriate				
		Fully disagree	Disagree	Not sure	Agree	Fully agree
A.	Conserving water catchments increases the value of the farm.					
B.	Conserving water catchments improves water catchment and water quality					
C.	Conserving water catchments reduces soil erosion					
D.	Conserving water catchments reduces surface runoff and floods					
E.	Conserving water catchments improve recreation sites and sceneries.					
F.	Conserving water catchments reduces health risks associated with poor sanitation e,g. diarrhea and cholera					
G.	Conserving water catchments maintains shades at the water					

	streams/ rivers, farms and reduce the rate of direct evaporation					
H.	Conserving water catchments provides habitat for other wild fauna					
I.	Water catchments are the sources of natural herbs					
J.	Water catchments are the sources of construction materials					
K.	Water catchments are the sources of fuelwood					

1. Are you aware of any conservation programs on water catchments in your location (please tick (√) as appropriate)?		
Yes		No
2. How do you perceive the importance of conserving water catchment area (please tick (√) as appropriate)		
Conserving is extremely important and quite desirable	Conserving is important and necessary	I don't find it important or necessary to conserve water catchments
3. If a system is introduced to contribute a certain amount of money that can be used for improving the condition of the catchment, would you be willing to contribute?		
Yes		No

4. If your answer in question 1 is Yes, how much would you be willing to contribute per month (in Tshs;)……..

5. If your answer in question 1 is No, please give a reason as to why you are not willing to contribute?

……

……

…….....

.....

6. If in any case there are no rivers/or that the government decides to drain it so that water flows through pipes to river Pangani and later to Indian ocean, would you ask for compensation?

Yes ( ) No ( ).

7. If yes how much (in Tshs) per month would you accept as compensation for the loss?

.....

<table>
<tr><td colspan="5">8. Do you participate in any environmental conservation program in your location (please tick (√) as appropriate)?</td></tr>
<tr><td colspan="3">Yes</td><td colspan="2">No</td></tr>
<tr><td colspan="5">9. If Yes, please show how do you participate in such programs of conservation water catchment (please tick (√) all that apply)</td></tr>
<tr><td colspan="2">Plant trees at the farm or at the buffer zone ( )</td><td rowspan="2">Reserve part of your land uncultivated near/ at the riparian zone</td><td rowspan="2">Improve cultivation methods at the catchments slopes</td><td rowspan="2">Control and minimize environmental degradation ie. Bush fire and mining/ quarrying at the catchments</td></tr>
<tr><td>Indegenous species</td><td>Non indegenous species</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="5">10. What is the distance (in Km) from your farmland to the water catchment? ……..
11. What is the major source of water for your daily domestic consumption? ……
12. How long (time spent in an hour) does it take to fetch water from the source mention in Qn 11 above?.....</td></tr>
</table>

13. How would you rate the availability of water fromthe water resource mentioned in Qn 11? (1 = Good, 2 = Fair good, 3 = Poor, as appropriate)			
Tape water	Streams water	River water	Water furrow (*Mfongo*)
14. Are you aware of any rules/laws established by local government authorities/ community environmental clubs governing the environment about conservation of water catchments? (please tick (√) as appropriate)			
Yes		No	

1. **What should be done** to improve the sustainability of water catchment in your area?

…….....

…….....

…….....

…….....

…….....

…….....

…….....

…….....

Thank you for your co-operation and may God bless you.

1. Recommendation letter for research data collection

MZUMBE UNIVERSITY
(CHUO KIKUU MZUMBE)

OFFICE OF THE DEPUTY VICE CHANCELLOR (ACADEMICS)

E-Mail: vc@mzumbe.ac.tz
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Cell: +255 0754694029
Website: www.mzumbe.ac.tz

P.O. Box 1
Mzumbe
TANZANIA

Ref. No. MU/DPGS/INT/38/Vol. IV

Date: 30th April, 2019

TO WHOM IT MAY CONCERN

RE: INTRODUCTION OF MR. DARRA SILA N.

The bearer of this letter Mr. Darra Sila N. whose registration number is 15409085/T.17 is a postgraduate student at our University (Mzumbe University) pursuing **Masters of Science in Project Planning and Management (MSc. PPM).** As part of requirements for completion of his studies, he is collecting information on: **COMMUNITY WILLINGNESS TO PAY FOR IMPROVING CONSERVATION OF WATER CATCHMENTS IN HAI DISTRICT**

This letter serves to achieve three purposes. Firstly, to introduce him to you, secondly, to request you to grant him permission to undertake the mentioned research at your organization, and thirdly to request you to facilitate any form of assistance he might need in order to successfully pursue this noble exercise at your organization. We can assure you that this activity is entirely for academic and will never be used for any other purposes.

We trust that you will accord our student with necessary assistance.

Sincerely yours,

Dr. Fred Alfred (PhD)
For: DEPUTY VICE CHANCELLOR (ACADEMIC

QUOTATION OF REF. NO IS ESSENTIAL

1. Letter of acceptance for research data collection (Introduction letter)

HAI DISTRICT COUNCIL

KILIMANJARO REGION
Tel : 27-2758441
Fax : 27- 2756102
Mkurugenzihai@yahoo.com

Executive Director's Office,
P. O. Box, 27,
HAI.

Ref.No.HDC/S.10/82/267

Date: 08/05/2019

For Whom It May Concern,
Hai District Council.

RE: LETTER OF INTRODUCTION
FOR MR. DARRA SILA N.

This is introduce Darra Sila N. who is an Masters of Science in Project Planning and Management (MSc. PPM)

Currently he is conducting research in ***Community willingness to pay for improving conservation of water catchments*** in Hai District Kilimanjaro.

Permission has been granted from ..... to ..... being on his request. The permission is sought to allow the student to interview and/or use a questionnaire to obtain data.

Kindly, give him required cooperation and make sure he abides by Government regulations and directives.

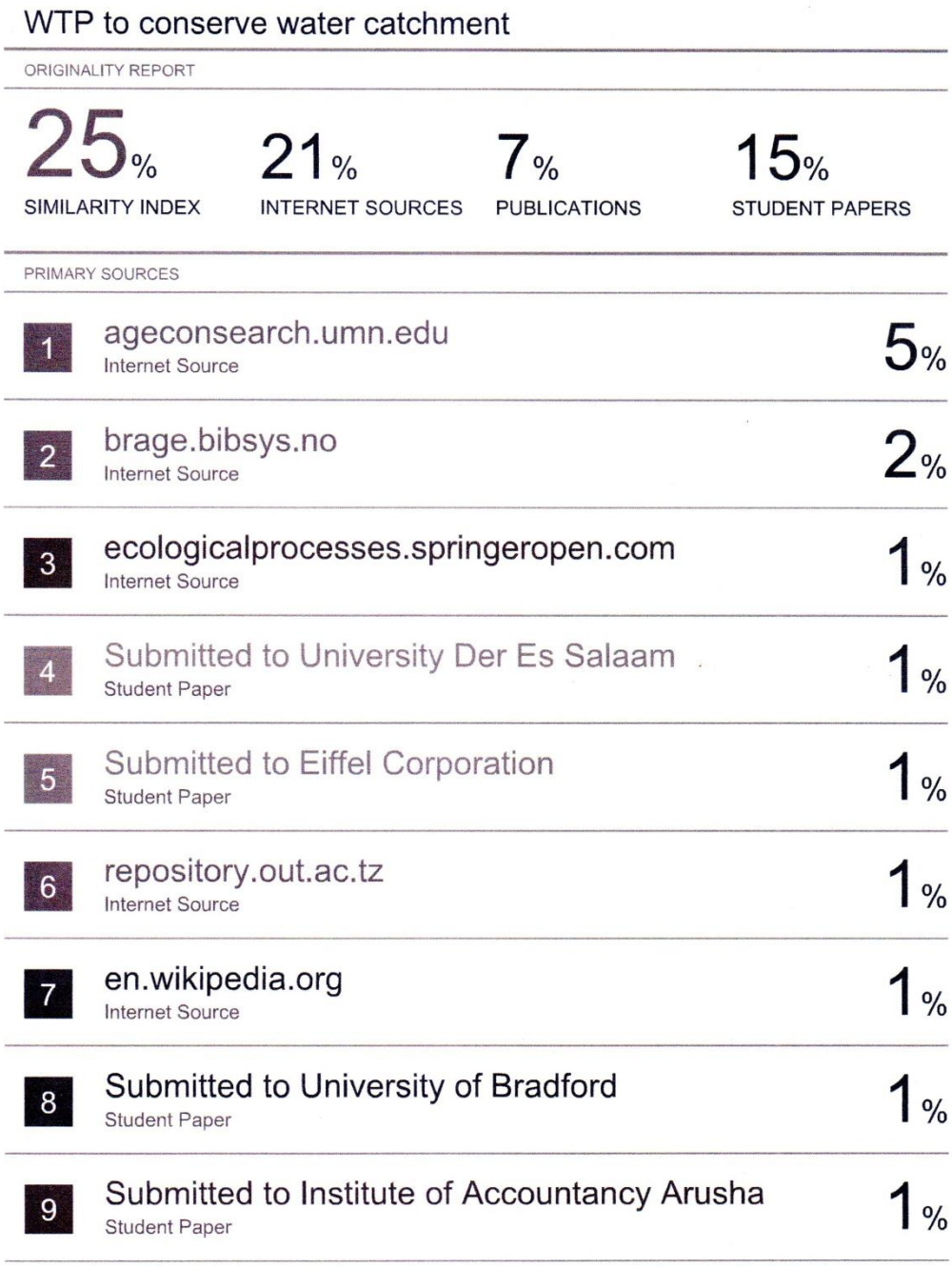
Thank you for your cooperation.

Semati L.
For: DISTRICT EXECUTIVE DIRECTOR
HAI

DISTRICT EXECUTIVE DIRECTOR
HAI

Copy:
- Deputy Vice Chancellor – For Information
  Mzumbe University
- Darra Sila N. -Researcher

1. Plagiarism (originality) report



WTP to conserve water catchment

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