IMPACT OF TERRESTRIAL NATURAL RESOURCES MANAGEMENT APPROACHES ON COMMUNITY ECONOMIC BENEFIT IN WESTERN TANZANIA

ALLAN LUKINDO HIZA

A THESIS SUBMITTED IN FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN NATURAL RESOURCES ECONOMICS (PhD)

DEPARTMENT OF ECONOMICS AND COMMUNITY ECONOMIC DEVELOPMENT

OF THE OPEN UNIVERSITY OF TANZANIA

2023

CERTIFICATION

The undersigned certify that they have read and hereby recommend for acceptance by The Open University, a thesis entitled; **"Impact of Terrestrial Natural Resources Management Approaches on Community Economic Benefit in Western Tanzania"** in fulfilment of the requirements for the award of Degree of Doctor of Philosophy in Natural Resources Economics (PhD).

…….
Prof. Deus D. Ngaruko (PhD)
(Supervisor)

……
Date

……
Prof. Magreth S. Bushesha (PhD)

(Supervisor)

……
Date

COPYRIGHT

DECLARATION

I, **Hiza, Allan Lukindo,** declare that this work presented in this thesis is my sole original work and that it has not been presented and will not be presented to any other University or academic institution for a similar, other degree or academic award. When other people's work has been used, references have been provided. It is in that regard I declare that this work is originally mine. It is hereby presented in fulfilment of requirements for the degree award of Doctor of Philosophy in Natural Resources Economics (PhD).

…….....

Signature

13/10/2023

……

Date

DEDICATION

This work is dedicated to my family; especially my dad Mwalimu Mattya Hiza Kontang'ombe- RIP, Mom Mary Mwikae Makighenda -RIP, and Edna Kombuche Mamsingwa- RIP.

ACKNOWLEDGEMENTS

The first and foremost gratitude is extended to the Almighty God, the creator of nature and human life that are studied in this research. His mercy, favors, and love made the universe exist. He enabled me to study nature-human relationships. My Lord, you deserve to receive my regards.

Sincere appreciation goes to my two supervisors, Prof Deus D. Ngaruko (PhD) and Prof Magreth S. Bushesha (PhD) from The Open University of Tanzania and the community around the Greater Mahale Ecosystem. You shared with me your many years of experience. Your knowledge and advice shaped the proposal to the final work. You made this study to be a joy. Dear professors, your advice to make a combo of quantitative -and qualitative methodology was very important and appreciated.

Ayesiga, my lovely wife, you always supported and encouraged me even on some sleepless nights!, my daughter Senoritha, and my sons Elisha and Emmanuel are all “the love of father”. Sisters Mwl Agnes, Mwl Beatrice, Catherine; Brother Dominick, Mhilu, and Francis, you sacrificed a lot and encouraged me consistently to ensure this work is accomplished. Your contribution to this achievement is recognized and appreciated. I cannot attempt to mention all people involved in this work because are many. However, Beatrice J. Salu (RIP), I appreciate her support. I am indebted to whoever contributed to enabling this work to become a reality. Thank you.

ABSTRACT

While the economy of most rural areas depends on nature and their interactions, the impact of different terrestrial natural resources management (TNRM) approaches on community economic benefit (CEB) in Tanzania is most likely partially known. This research was carried out in Western Tanzania to assess impact of government and communal, consumptive, and non-consumptive approaches on community economic benefit. The main natural resources studied were forests and wildlife because they are most affected by land conversion and degradation. The study developed a research model CEB = $\beta_0 + \beta_1 CCT + \beta_2 CNC + \beta_3 CCD + \beta_4 GCT + \beta_5 GNC + \beta_6 GCD + \ldots + \varepsilon i \ldots$ (Equation 8) on CEB gained from TNRM approaches. A four-point numerical scale survey questionnaire was administered to 400 respondents, and an interview guideline was administered to 40 key informants' interview. Quantitative analysis run by SPSS to test the study's 6 null hypotheses revealed that all 6 conservation approaches had an impact on CEB. All 6 null hypotheses were rejected because p-values were less than 0.005. Furthermore, the government consumptive conservation approach had the highest regression impact on CEB with B coefficient =1.49, at 95% Confidence Interval=1.4, 1.57; p =0.000. Moreover, government approaches for non-consumptive and consumptive approaches Mean were 50.08 and 32.31 respectively, which were higher than communal approaches (46.99) and (31.17) respectively. The results suggest that to maximize CEB, an integrated hybrid combo of TNRM approaches with government consumptive approaches prioritized.

Keywords: *Community Economic Benefit, Natural Resource Management, Government, Communal, Consumptive, Non-Consumptive, Greater Mahale Ecosystem, Tanzania.*

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS AND ACRONYMS

CAMPFIRE	Communal Areas Management Programme for Indigenous Resources
CAP	Conservation Action Plan
CBD	Convention on Biological Diversity
CBNRM	Community-Based Natural Resource Management
CEB	Community Economic Benefit
COP	Confference of Parties
CPR	Common Pool Resource
DRC	Democratic Republic of Congo
GDP	Gross Domestic Product
GME	Greater Mahale Ecosystem
IUCN	International Union for Conservation of Nature
JFM	Joint Forest Management
MEA	Millennium Ecosystem Assessment
NESR	National Environment Statistics Report
OUT	The Open University of Tanzania
PES	Pay Ecosystem Service
SAPA	Social Assessment for Protected and Conserved Areas
SMS	Simple Random Sampling
SSA	Sub-Sahara Africa
TANAPA	Tanzania National Parks Authority
TAWIRI	Tanzania Worldlife Research Institute
TNRM	Terrestrial Natural Resource Management

UNEP	WCMC UN Environmental Conservation Monitoring Center
UNEP	United Nations Environment Program
URT	United Republic of Tanzania
VGS	Village Game Scout
VNRC	Village Natural Resources Commitee
WCMC	World Conservation Monitoring Center
WCPA	World Commission on Protected Areas
WMA	Worldlife Management Area

CHAPTER ONE

INTRODUCTION

1.1 Background Information

Economic benefiting and poor economic welfare status in natural resources-rich countries is an unresolved parable (Tietenberg, 2012; Tchakatumba, *et al.*, 2019; Andika, 2020; Keane, *et al.*, 2020). The astonishing trend is that since early 1990s, rural people who could enjoy bigger natural resources and economic benefits suffer poor economic welfare (Carl &Tomas, 1991; Barbier, 2007; Anderson, 2010; Leisher & Hess, 2017; Andika, 2020). That unpleasant trend is vivid in Africa where countries with rich natural resources are struggling with poor economic welfare (Murphree, 2009; Venables, 2016; Galvin, *et al.*, 2018; Andika, 2020).

Furthermore, Sub-Sahara Africa (SSA) predominantly rural areas such as Greater Mahale Ecosystem (GME) in Tanzania, are experiencing poor economic welfare and higher retarding economic growth of 2.5% in 2017 and 2.3% in 2018 (URT, 2012; Leisher & Hess, 2017; World Bank Report, 2019). To address that challenge, economists brought in their knowledge and skills.

Many economists including high-profile ones, such as Nobel Laureate Ken Arrow have applied economics in natural resources management to bring balance in conservation and economic benefit (Pigou, 1920; Arrow, *et al.,* 1995; Ribot, 2003). Their efforts with other thinkers resulted in a movement of equitability in conservation (CBD, 2011; UNEP- WCMC, 2018; COP 26, 2021). However, they had less achievement because marginalized rural communities who mostly depend on and use common pool resources (CPR) to earn income are still comparatively

poor (Kerapeletswe & Lovett; 2005; Murphree, 2009; Bluwstein *et al.*, 2016). It was unfortunate that the balance point between vast natural resources and community economics was not attained.

A balance to bring economic benefit and natural resources management has been on the World agenda (UNEP- WCMC, 2018; COP26, 2021). Furthermore, equitable economic benefit of protected areas is a key aspect of conservation congress Aichi meeting. Aichi meeting held from 18th to 29th October 2010 in its Target 11 states that "Protected areas are effectively and equitably managed" (CBD, 2011). Equitable management of natural resources and biodiversity includes fair distribution of economic benefits (CBD, 2011). Regardless of the importance of economic benefits that can be accrued from conservation interventions, fewer studies have been conducted on conservation economic benefits (Andam, *et al*., 2010; Amira, *et al.*, 2015; Steffen, *et al.*, 2015; Lewis, *et al.*, 2017; Moyo, *et al*., 2017; Galvin, *et al.*, 2018; UNEP–WCMC, 2018; Andika, 2020; Keane *et al.*, 2020). Following a few studies conducted, UNEP–WCMC (2018) report calls for assessing the flow of natural resources economic benefit as a priority. To understand natural resources' economic benefits in Tanzania, it is crucial to go through Tanzanian natural resources conservation history, approaches and theories.

Tanzania's natural resources management approaches have a history of pre-colonial, colonial, and independence era. Since the pre-colonial era, Tanzania has practiced communal-indigenous natural resources management by indigenous people (Pailler, *et al*., 2015). Consrvtion was mainly guided by Conservation and Ecology Theory which depended on a "wise use of resources" (Leopold, 1933 in Darling, 1964).

During the Colonial era, private and government-state natural resources management started to be practiced (Pailler, *et al*., 2015). Conservation in this era guided by The Optimal Control Theory that focused on optimization (Weber, 2011). After independence and after the 1967 Arusha declaration, government-state and communal-indigenous natural resources management had been the main conservation approaches (URT, 2009). Conservation during this era had been guided by The Optimal Control Theory, Conservation and Ecology Theory and Common Pool Resource (CPR) Theory that gave mandade to indigenous and local institutions (Ostrom, 2010; Weber, 2011; Pailler, *et al*., 2015).

The communal-indigenous, private, and government-state natural resources management has been practiced in both terrestrial and aquatic natural resources (URT, 2009). Moreover, different natural resources management approaches were necessary because Tanzania has vast terrestrial ecosystems traversing communities and public lands (Taylor, 2011). Tanzania has beautiful vegetative ecosystems such as equatorial forests, acacia woodlands, miombo woodlands, tropical forests, mountain forests, and grasslands (Bluwstein, 2017). Furthermore, Tanzania has appealing large grassland ecosystems such as Serengeti; Miombo woodlands such as Greater Mahale and Mountain Ecosystems such as Mount Kilimanjaro (Taylor, 2011).

Additionally, Tanzania has diversities of wildlife with all big five (Elephant, Lion, buffalo, giraffe, and rhino), amazing migratory wildebeest, endangered chimpanzee, and beautiful colobus monkey (URT 2009; Taylor, 2011; Piel, *et al.*, 2013; Morrison, *et al.*, 2016; John, *et al*, 2019). The mentioned ecosystem and natural

resources are accessed for utilization either through Government-state or communal-indigenous conservation approaches.

Varieties of ecosystems and natural resources face pressure on access and utilization that benefit community (Steffen, *et al.,* 2015; COP 26, 2021). Demand and approaches of natural resources utilization contribute to the recent degradation of natural resource domestication of land (Steffen, *et al.,* 2015). Tanzania's forest loss and degradation trend are higher at 6% compared to 3% of the Democratic Republic of Congo (DRC) and Angola (Kaijage, 2016). Additionally, the degradation of land, wildlife habitats, and corridors are happening at a fast rate that causes loss of wildlife (TAWIRI, 2009; Morrison, *et al.,* 2016). Furthermore, Greater Mahale Ecosystem (GME) which is a habitat for endangered chimpanzees, forest loss is higher at 10% than average Tanzanian 6% (TAWIRI, 2009; William, 2018). The Greater Mahale Ecosystem lost 1 million acres of forest (29% of forest cover) in the last 30+ years (Kaijage, 2016). The global continues with debate on conservation approaches, equitable community benefits and global warming (COP 26, 2021). The natural resources degradation rate that is linked to community economic benefit should be halted.

Among noted causes of land domestication, forest degradation and unsustainable utilization of wildlife is for an economic benefit such as conversion for livelihood purposes that is high in terrestrial than aquatic resources (Steffen, *et al.,* 2015; Morison, 2016; Keane, 2020). To halt forest, wildlife loss, domestication trends, and contribute to decrease of global warming, Tanzania set aside 32.5% of her land as reserve lands (NESR, 2017). This achievement is beyond the 30 by 30 goal of

conservation and desire of the globe (COP26, 2021) and is beyond 17% proposed by the Aichi target (IUCN, 2017; NESR, 2017). The land reserved for conservation is bigger than the 20% of land used for agriculture (NESR, 2017); therefore, it should substantially address community economic benefit. However, the reserved lands do not guide land conversion and domestication in village or community lands.

The Greater Mahale Ecosystem practicing both communal-indigenous and government-state natural resources management approaches is vulnerable with a higher degradation rate of 10% than the average Tanzania rate of 6% (TAWIRI, 2018; William, 2018)). This study aimed to understand relationship of community economic benefits which is the main reason of natural access and terrestrial natural resources management approaches. The study was carried out in Greater Mahale Ecosystem at Western Tanzania ecoregion within Kigoma and Katavi Regions because is a place facing relatively higher rate of degradation compared to Rukwa region. This research study focused on forests and wildlife because are terrestrial natural resources highly affected by domestication and conversion (Piel, *et al,* 2013; Steffen, *et al.*, 2015; Leisher and Hess, 2017; William, 2018).

1.2 Research Problem Statement

Tanzania especially the Western ecosystem such as the Greater Mahale Ecosystem (GME) contains vast terrestrial natural resources such as forests, wildlife, and gorgeous land, yet communities residing in the ecosystem strive for weak economic welfare (Piel, *et al.,* 2013; Hall, *et al.,* 2014; Leisher & Hess, 2017; John, *et al.*, 2019; World Bank Report, 2019). Greater Mahale Ecosystem community economic benefit is challenged by type of natural resources management approach applied

either government-state, communal-indigenous, consumptive, or non-consumptive utilization management approaches.

One argument is that government and non-consumptive protection of natural resourcesas opposed to communal and consumptive approaches may affect accessibility and impair community benefit (Kaimowitz & Sheil, 2007; McCormick & Fuwa, 2015; Sulle & Banka, 2017). While the other argument is that government and non-consumptive protection of natural resources increases their value and creates economic benefit (Tyrrell *et al.*, 2019; Tchakatumba, *et al.*, 2019; Andika, 2020).

While GME applies both government-state, communal-indigenous, consumptive, and non-consumptive natural resources management approaches (Pailler, *et al.*, 2015; TAWIRI, 2018), different Theories such as Common Pool Resource (CPR) Theory, Optimal Control Theory, and Conservation and Ecology Theory support different conservation approach. Consequently, there was no justification for which natural resources management approaches should be applied to benefit communities economically and conservation-wise. Therefore, a need to carry out this study in Greater Mahale Ecosystem became vital.

1.3 Research Objectives

1.3.1 General Objective

The general objective of this study was to determine the impact of terrestrial natural resources management (TNRM) approaches on community economic benefit (CEB) in Greater Mahale Ecosystem in Western Tanzania.

1.3.1 Specific Research Objectives

i. To examine impact of communal-indigenous consumptive terrestrial natural resources management approach on community economic benefit.
ii. To study impact of communal-indigenous non-consumptive terrestrial natural resources management approach on community economic benefit.
iii. To survey impact of communal-indigenous terrestrial natural resources management control and development on community economic benefit.
iv. To examine impact of government-state consumptive terrestrial natural resources management approach on community economic benefit.
v. To study impact of government-state non - consumptive utilization of terrestrial natural resources management approach on community economic benefit.
vi. To survey impact of government-state terrestrial natural resources management control and development on community economic benefit.
vii. To compare impact of Communal consumptive, non conumptive utilization and controls to Government consumptive, non conumptive utilization and controls

1.4 Research Hypothesis

The thesis had a general hypothesis that terrestrial natural resources management approach impact community economic benefit. The research had both null and alternative hypothesis.

i. Null hypothesis (Ho): Terrestrial natural resources management approaches do not impact community economic benefit.
ii. Alternative hypothesis (Ha): Terrestrial natural resources management approaches impact community economic benefit.

1.4.1 Specific null Hypothesis

H_1: Communal-indigenous consumptive terrestrial natural resources management approach does not have a statistically significant impact on community economic benefit.

H_2: Communal-indigenous non-consumptive terrestrial natural resources management approach has no statistically significant impact on community economic benefit.

H_3: Communal-indigenous terrestrial natural resources management control and development has no statistically significant impact on community economic benefit.

H_4: Government-state consumptive terrestrial natural resources management approachhas has no statistically significant impact on community economic benefits.

H_5: Government-state non-consumptive utilization of terrestrial natural resources management approach has no statistically significant impact on community economic benefit.

H_6: Government-state terrestrial natural resources management control and development has no statistically significant impact on community economic benefit.

1.5 Significance of the Study

Improved natural resources management and investment approaches benefited the economy of Malaysia, Costa Rica, and Thailand (Scherl *et al.*, 2004; Andam *et al.*, 2010; Amira, *et al.*, 2015). Likewise, Tanzania's natural resources management

contributed a 3% increase in annual direct employment estimated at 377,000 direct jobs since 2010 and it was to rise to 497, 000 jobs (3.9%) by 2021 (NESR, 2017). This is a substantial amount of contribution to the community economy and GDP. Providing natural resources management-economy sectorial attention, will improve rural Tanzania community economy such as around Greater Mahale Ecosystem. In turn, Tanzania's GDP will increase.

Moreover, to halt natural resource degradation trend and address sustainable natural resource conservation is necessary for this decade that faces serious climate change (Andika, 2020; COP26, 2021). Improving community economy through natural resources management approaches is the finding of this study. The finding may be used as a decision tool to increase communities' economic benefit. Besides, this study adds value to advancing economic benefit and natural resources relationship studies and literature which is crucial in this century (Venables, 2016; Sulle & Banka, 2017; Andika, 2020; COP26, 2021). This study advancies knowledge on applying different conservation Theories whereby one theory is not fitting all types of Natural Resourcesconservation approaches.

1.6 Justification of the Study

This study addresses the existing conflicting choices between government-state, communal-indigenous, consumptive, and non-consumptive natural resources management approaches in addressing economic benefit. Such conflicting decisions includes choices to either gazette more conservation areas or degazete some protected areas to permit consumptive utilization. Moreover, the study paves a way on not relying on one conservation theory rather think on integrated approaches due

to findings that one theory is not good enough to define how should conservation be carried out to benefit communities economically and conservation-wise. Finally, concurring with Defra (2007) study's findings can be used as a benefit transfer method to predict terrestrial natural resources conservation and community economic benefit situation in other areas.

1.7 Limitation of the Study

The study was faced by main three limitations. The first onewas a scope limitation. The study was carried our in Western Tanzania Regions only, though those regions were the one highly affected by natural resources degradation, the study could be expanded to other regions in the Country and to other countries as well. Moreover, the study focused on microeconomic and did not focus on macroeconomic. These limitations were mainly due to less financial resources and time to support the study. The study also faced a limititaion of anonymity in refraining from mentioning responded names to keep confidentiality and research ethics.

1.8 Organization of the Thesis

This research thesis starts with the first chapter of introduction that has background, research problem, objectives, and research hypothesis. The second chapter is literature review that includes, definitions, critical theoretical and empirical reviews, natural resources management policy analysis, identified research gaps, and conceptual framework. The third chapter is methodology which includes research philosophy, research strategy, sampling methods, and how data is analyzed and presented. Chapter four is research findings, presentations through Tables, Figures, and discussion. Chapter five is research conclusions and recommendations. The final

part of this thesis is references and appendices including the used questionnaire, key informant interview guide, and respective authorities' approval to undertake this study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Chapter Overview

This chapter presents a critical literature review on conceptual definitions, related theoretical literature, empirical literature, and a review of related policies. Finally, the chapter narrates the research gaps and presents a conceptual framework for the study.

2.2 Conceptual Definitions

2.2.1 Community Economic Benefit

Community economic benefit (CEB) is a wide term defined as value received by people such as food, energy, spiritual enrichment, recreation, and appealing experiences (Ribot, 2003; Murphree, 2009). Moreover, Defra, (2007) expanded the meaning of direct use, indirect use, non-use, and option values to communities. While Venables (2016) stated it as any quantifiable gains in terms of money generated, saved, or cost reduced because ofan action. Those gains are revenues, profit, net income, creation of jobs, wealth creation, cash flow, or lower raw material and opportunity costs. Whereas the Millennium Ecosystem Assessment – MEA (2005) defined it as “the gains people obtain from ecosystems” that include leisure, entertainment, cultural activities, employment, tourist services, and handicrafts. In this study community economic benefit (CEB) meaning are all values, uses, and gains people receive from nature.

2.2.2 Economic Benefit Flow

Economic benefit flow (EBF) is defined as streams of share gained that are

controlled by a bundle of powers, rights, proximity, and social relationships (Ribot, 2003; Murphree, 2009). Furthermore, Milner-Gulland (2012) explained economic benefit flow as lines of complex social-economical-ecological interlinkages. Additionally, it is summarized as channels of gains that are affected by barriers, boundaries, and management approaches (Hutton *et al.*, 2005). This study examined gain of community economic benefit from natural resources conservation to communities who are indigenous people and its interconnections.

2.2.3 Terrestrial Natural Resources

Terrestrial natural resources are defined as land reserves that are not man-made such as land, wildlife, forests, and small inland water biomes (MEA, 2005; Defra, 2007; NESR, 2017). These are also known as land resources accessed for utilization (Ribot, 2003). Steffen *et al.* (2015) called them land ecosystems that are natural capital. Most of them are renewable and regenerating resources such as forests and wildlife. In this study, terrestrial natural resources focused are forests and wildlife that are accessed for utilization in the Greater Mahale Ecosystem.

2.2.4 Terrestrial Resources Management Approaches

Terrestrial natural resources management (TNRM) approaches refer to the way resources are accessed, utilized, developed, controlled, and organized, to produce intended results from a landscape (Kerapeletswe & Lovett, 2005; NESR, 2017). The natural resources management approaches in Tanzania are either communal-indigenous, government-state, or private (URT, 1998a; URT, 1998b). Communal TNRM approach is defined as a community's self-organized, control, and directing of resources (Saunders, *et al.*, 2014; WCPA, 2019). Additionally, International

Union Conservation for Nature defined communal-indigenous natural resources management approach as "Governance by indigenous people and local communities" (IUCN, 2017). Moreover, private TNRM approach is defined as control, regulations, and directives on independent land by individuals or cooperate (IUCN, 2017; URT, 1999b; WCPA, 2019). Whereas, government-state natural resources management approach is defined as governance, organization, control, directing, and developing resources on reserved or protected lands under government custodianship (URT, 1998a; URT, 1998b; URT, 2009).

2.3 Theoretical Literature Review

2.3.1 Conservation and Ecology Theory

Conservation and Ecology Theory states that, "a community of living things interact and work together, and that anthropogenic interaction and activity impinge or coincide with nature" (Darling, 1964). This theory is crucial in all seven objectives of the study where we study the relationship and interaction of human to nature. Those interactions were explained by fathers of conservation such as Professor Aldo Leopold who stated it as a "wise use of resources" (Leopold, 1933 in Darling, 1964).

It is argued that a healthier interaction and wise use of resources will benefit ecology and human beings who are part of it (Darling, 1964; Bluwstein, 2017; Russell *et al.,* 2018). This theory is supported by some conservation scholars in view that wise use of resources, increases ecosystem services function and in turn creates a flow of income (Tchakatumba, *et al.,* 2019; Andika, 2020). Early scientists such as Scitovsky (1976) support that conservation is a choice, human beings will make choices that will maximize their benefit. This theory guided all seven objectives of

the study because management approaches are all about interaction and “wise use of resources” which are choices on resource utilization in producing benefits to human beings.

Even though the theory is supported by contemporary natural resources management approaches such as community-based natural resource management (CBNRM), it has weak areas (Dressler, *et al.*, 2010; Muyengwa and Child, 2017). The “wise use of resources” emphasizes mainly land use with ecological needs and belittles indigenous people’s economic needs (Darling, 1964). Furthermore, the theory does not explain how interactions with resources will be attained sustainably either under community management approach or under government approach (Cavendish & Campbell, 2005; Child & Barnes, 2010; Galvin, 2018; Oduor, 2020). Therefore, Common Pool Resource Theory and Optimal Control Theory that guide communal management and Government management were invited.

2.3.2 Common Pool Resource Theory

Communal interaction of natural resources and human beign under objective one to objective three was guided by Common Pool Resource (CPR) Theory. The theory states that indigenous and local institutions are often successful in managing common pool resources effectively (Ostrom, 2010). The theory focuses on efficacy and functionality of common pool resources management by indigenous. The theory gives resource control and right to indigenous people in a self-organizing way and increase collective accountability to institutions (Roe, *et al.*, 2009; Ostrom, 2010). Saunders (2014) explained that common pool resources theory builds on social capital, social learning, and empowerment and base on transparency and consistency

principles. Some scholars support this by arguing that resources should be left to community custodianship to be utilized in the way they think is better rewarding (Ellis & Allison, 2004; Keough and Blahma, 2006; Russell*et al.*, 2018). This theory underpinned the study objective 1, 2 and 3 on indigenous people's communal resources utilizations, controls, and access that reward community economics.

However, there are some weaknesses in this theory. The theory did not explain the risk of trial and error in building efficient local institutions in a way of "self-organizing" (Saunders, 2014; Tchakatumba, *et al.*, 2019). Moreover, Kerapeletswe & Lovett (2005) and Morrison *et al.*, (2016) noted that common-pool resources (CPR) are depleting which is common phenomenon in degrading Greater Mahale Ecosystem (William, 2018) due to uncoordinated rules of engagement. The uncoordinated rules of engagement mean weak controls and decision-making, and less economic benefit. Such coordinated ways of interactions are implemented by government conservation approach. To study such level of controls and enforcement of laws in communal natural resources management and in Government conservation approaches, Optimal Control Theory was invited.

2.3.3 Optimal Control Theory

The study Objective three and objective six were about controls. Moreover, objectives 4, 5 and 6 were government control approaches. Therefore, objectives three, four, five and six were underpinned by Optimal Control Theory that focuses on optimization. It states that in a normal undisturbed system, a situation trajectory $x(t)$ for all $t \geq t0$ is determined by initial data ($t0$, $x0$). Whereas, known initial state $x(t0) = x0$ are all function of time $t \geq t0$ and mathematical are $x^{\cdot}(t)=f(tx(t))$ (Weber,

2011, pp. 81-148). Therefore, a decision maker's actions might influence the state's trajectory. Such actions include control over the dynamic process and can change the system flow (Moyo, *et al.*, 2017).

Optimal exploitation and utilization of regenerative natural resources are attained at the climax of "n", a function of resource exploitation and development (Barbier, 2007). Moreover, it is also accepted that natural resources should be controlled and regulated for sustainability (Lewis, *et al.,* 2017). This theory guided the study objective 3, 4, 5 and 6 in gauging controls and regulations that intend to optimize utilization but also produce community economic benefit (CEB). This theory requires high technical capacities which are found in Government conservation approaches. However, benefits can be gained without resource consumption (Bluwstein, 2017; Andika, 2020). Such benefits that may not include resource utilization can include natural-based solutions (NBS) like sell of avoided carbon credits (COP 26, 2021). The theory is challenged on how optimal utilization and control of natural resources should be harmonized to inform both sound conservation and economic welfare (McShane, *et al.,* 2010; Rosser and Leader-William, 2010; Andika, 2020). This challenge invited application of Demand Theory assesses to consumptive and non -consumptive conservation economic benefits.

2.3.4 Demand Theory

Demand Theory states that when consumer demands for goods and service increase, their price increases. The theory shows that when supply of good or service is reduced or controlled in a market, then its demand can increase, then its price can increase. The theory shows that goods or services availability determines demand so

as the price to equilibrium (Ahmed, 2004; Tietenberg, 2012). Controls of natural resources regulate supply, access, and availability, which, creates demand (Ribot, 2003; Sulle & Banka, 2017). Created demand increases economic benefit through increased price and revenue. This theory is critical in government-state-management of natural resources practiced in Greater Mahale Ecosystem (TAWIRI, 2018) as well as in communal contrals. The theory guided the study on utilization controls and access objective 3 and 6 of the study, in turn manage demand and pay back to the community as a benefit.

However, this theory is challenged that it can apply to normal goods, and it might not apply to most natural resources which are common goods (Leisbentin, 1950). In common goods and open access, excludability and property right are difficult so as control supply or scarcity creation (Hardin, 1968). To address the challenge of normal goods in natural resources, consumptive natural resources management approaches were studied that are mostly close to normal goods.

2.4 Empirical Literature Review

Various studies have been conducted on different natural resources management approaches and economic well-being (Child & Barnes, 2010; Galvin, *et al.*, 2018; Davis, *et al.*, 2019; Keane, *et al.*, 2020; Andika, 2020). This trend of studies was worth re-reading to make a meaningful gain of knowledge from existing literature and identify knowledge gaps.

2.4.1 Communal-Indigenous Natural Resources Management

Child & Barnes (2010) and Galvin, *et al.*, (2018) conducted a study on community-based natural resources management (CBRM) effectiveness in Southern African

countries (Zimbabwe, Botswana, Namibia, and Zambia). Both studies revealed that most community-based natural resources management governance is weak and does not practice equity. Most of them have favoritism and there is no fairness in resource utilization. Even though community based natural resources management (CBNRM) is the most widely accepted contemporary communal natural resources management, it is questioned on sustainability and benefit equity (Child & Barnes, 2010; Muyengwa & Child, 2017).

Thes tudy by Child & Barnes (2010), which concur with Muyengwa & Child (2017) conclusion, is in line with Cavendish & Campbell (2005) study findings on rural poverty, environmental inequality, and income in Zimbabwe. Cavendish & Campbell (2005) concluded that where community-based conservation is weak there is no equity. In Greater Mahale Ecosystem, communal-indigenous forest management is practiced through village natural resource committees (TAWIRI, 2018). This research studied community based natural resources management (CBNRM) approaches to controls and utilization of natural resources that inform community economic benefit (CEB).

However, Nkonya, *et al.,* (2008), Mosimane & Silva (2015), Davis *et al.* (2019) and Tchakatumba, *et al.,* (2019) studies of natural resources management have a different conclusion. Nkonya, *et al.,* (2008) conducted a study on natural resources management and the economy of Uganda. Additionally, Davis, *et al.,* (2019) conducted a conservation institution review on community based natural resources management (CBNRM) in Zambia; while Mosimane & Silva (2015) conducted community based natural resources management (CBNRM) and community benefit

sharing study in Namibia. Whereas Tchakatumba, *et al.,* (2019) conducted a study on Zimbabwe community based natural resources management (CAMPFIRE) on whether community wildlife management ensures household economic benefit. Both studies concluded that when local communities are benefiting from natural resources, there is both increase in economic welfare and compliance with natural resource management. The mentioned studies stressed management equity and less economic benefit equity. For that reason of fewer studies on communal natural resources management approach contribution to community economic benefit, this research was carried out in Greater Mahale Ecosystem.

2.4.2 Private Natural Resources Management

Child & Barnes (2010) studied private natural resources management trends in Southern Africa. The study shows that the former communally managed natural resources are transformed into private ownership management as it is also noted by Roe, *et al.,* (2009). Furthermore, this trend is noticed in Kenya, resulting in conservancies such as Lewa and Loisaba. Even though the study did not clearly state a reason for such a shift, there is an indication that management challenges such as costs and less gained economic benefit are the main reason (Rosser and Leader-Williams, 2010). This approach is less practiced in Greater Mahale Ecosystem (TAWIRI, 2018); therefore, it has not been studied in this research.

2.4.3 Government-State Protected Area Natural Resources Management

Franks & Small (2016) detailed stepwise social assessment of protected areas (SAPA). They showed how costs, benefits, and social impacts arising from establishment and maintenance of protected areas and their distribution can be

assessed. The practical study finding indicated that the empowerment of people and the reduction of inequalities in costs and benefits increase conservation effectiveness. Furthermore, in Costa Rica and Thailand, Andam, *et al.,* (2010) studied modern natural resources management through "existence of protected areas". The study found that there was an improvement in community economy welfare around protected areas and countries. Moreover, conclusion from a review oft he global dynamic of protected areas conducted by Lewis, *et al.,* (2017) and studied impact of wildlife management areas on community by Keane, *et al.,* (2020) have a similar conclusion that the more protected areas the bigger the revenue. This research studied communities around GME including protected areas. Moreover, not only natural resources' economic benefits studied but also opportunity costs were studied.

However, the above-mentioned studies did not correlate economic benefits gained through different management approaches. Additionally, the studies did not study impact of different models of consumptive and non-consumptive natural resource utilization. This study learned community economic benefit relation with different models of natural resource utilization around Greater Mahale Ecosystem protected areas. Such protected areas included national parks, forest reserves, and wildlife hunting blocks.

2.4.4 Natural Resources Access Studies

Some studies conducted in Tanzania on natural resources management and community benefit. Bluwstein, *et al.,* (2016) conducted a study on conflicts over resource governance in Tanzanian wildlife management areas. Whereas Moyo *et al*.

(2017) conducted study on access to land and other resources in Tanzania's wildlife management areas (WMA). Whereas Keane, *et al.,* (2020) studied nature sustainability and impact of Tanzania's Wildlife Management Areas on household wealth. All these studies argued cautionary that conservation increases centralization of resources, which means conservation gives more power to the government than the community, hence it decreases economic welfare to community.

However, Muyengwa & Child (2017), Tyrrell, *et al.,* (2019), and Andika (2020) had different supportive opinions on collaborative ecosystem management. Supportively, they concluded that community economic welfare is improved when integrated conservation of ecosystem and ecological integrity are improved. The presented argument is that the better the ecological integrity the higher the ecological production and in turn economies. Greater Mahale Ecosystem conservation is thought to increase protected land and economic welfare of indigenous people (CAP, 2011; TAWIRI, 2018). The area is increasing government-state and communal-indigenous protected forests and employing economic benefits methods such as carbon financing of avoided carbon credit (TAWIRI, 2018). Following these interlinkages, community economic benefit relation with resource conservation has been studied in this research.

2.5 Natural Resources Management Policies in Tanzania

To reap relevant conservation-economic benefits, Tanzania in 1998 - 1999, formulated national terrestrial natural resources management policies (URT, 1998a; URT, 1998b; URT, 1999a). Management of terrestrial natural resources specifically forests and wildlife in Tanzania so as in the Greater Mahale Ecosystem, has been

either through government or communal approach before and after independence (URT, 1998a; URT, 1998b; Pailler, *et al*., 2015; TAWIRI, 2018).

2.5.1 Government-State Natural Resources Management Policies Statements

Government-state natural resources management is practiced in national parks, nature reserves, forest reserves, game reserves, and game-controlled areas (URT, 2009). Government–state wildlife management stated in the wildlife policy of Tanzania (URT, 1998a) strategy as "to retain the ownership and overall responsibility for management of wildlife resources by the state, to ensure that national priorities are addressed, and abuses are controlled". The other wildlife policy strategy (URT 1998a) strategy states that "wildlife will be managed by government, especially in wildlife core habitats of national parks, game reserves, and game-controlled areas". Moreover, the forest policy of Tanzania (URT, 1998b) second statement stipulates government forest management by stating that "to ensure efficiency in forest management and conservation, the central government forest reserves will be managed by one or several specialized executive agencies". These policy statements show that communities are not active players and therefore, they may benefit less economically from natural resources management.

2.5.2 Communal-Indigenous Natural Resources Management Policies Statements

Communal-indigenous natural resources management is practiced in community and village forests, general lands, wildlife corridors, and wildlife dispersal areas (URT, 1998a; URT, 1998b). Collaborative management such as community-based forest management (CBFM), joint forest management (JFM), or wildlife management area

(WMA) has been practiced (URT, 2009). Communal natural resources management is stipulated in the wildlife policy of Tanzania (URT, 1998a) strategy as "involving rural communities and other stakeholders in taking joint responsibility for the sustainable management of wildlife and other natural resources". The wildlife policy also states, "To transfer management of Wildlife Management Areas (WMA) to local communities thus taking care of corridors, migration routes, and buffer zones and ensure that local communities obtain sustainable tangible benefits from wildlife conservation. Unfortunately, enough, the term involving and transferring power shows good intentions, for conservation inclusivity. However, it clearly shows that currently they have less control and are not full players in natural resources management.

Furthermore, the forest policy of Tanzania (URT, 1998b) stipulates communal forest management in sixteenth policy statement which states that "Biodiversity conservation and management will be included in the management plans for all protection forests. Involvement of local communities and other stakeholders in conservation and management will be encouraged through joint management agreements". However, the mentioned joint management shows that communities will be involved and not have full control of resources.

Additionally, on communal forest management, the forest policy of Tanzania (URT, 1998b) thirty-ninth policy statement states that "local communities will be encouraged to participate in forestry activities". The term encouragement has been repeatedly used showing giving meaning that is not a mandatory action. This disempowers community in natural resources management and deprives them of

benefiting from natural resources management.

2.5.3 Economic Benefit from Natural Resources Policies Statements

Both wildlife and forest policies had few statements on economic benefit (URT, 1998a; URT, 1998b). The wildlife policy of Tanzania (URT, 1998b) states that "The policy will continue to give wildlife economic value to rural communities to enhance rural redevelopment without prejudice to the environment, and in such a way that the benefit compensates for the opportunity cost of this form of land use". While the forest policy of Tanzania (URT, 1998b), third policy statement states that "to enable participation of all stakeholders in forest management and conservation, joint management agreements, with appropriate user rights and benefits, will be established." Such stated benefit did not specify how economic or financial benefit can be accrued by communities from natural resources management. While economic benefit is a crucial point to be discussed in natural resources management, optimization and sustainability of regenerative natural resources are crucial as well to avoid resource exploitation.

2.5.4 Conventional Agreement in Natural Resources Management

Tanzania is a party to the convention on biological diversity (CBD) since 1996 when the country ratified it. In 2010, The CBD held its tenth meeting of the conference of the parties in Aichi Japan that produced Aichi targets. The meeting had 5 strategic goals and 20 targets (CBD, 2011). Aichi target 11 required that protected areas are "equitably managed" which meant sharing of economic benefits. The CBD (2011) required communities to equitably share the benefits arising from protection and should not bear inequitable costs only (IUCN, 2017; UNEP- WCMC, 2018). Equity

in benefits especially on use of nature-based solutions (NBS) such as carbon credit has been a global conservation agenda at Glasgow (COP 26, 2021). This ratification underpinned the study to examine equitability in both economic benefits and opportunity costs arising from natural resource conservation.

2.6 Research Gaps

The cited and reviewed literature shows that there is substantial research and studies on conservation of natural resources and economy (Nkonya, *et al.,* 2008; Andam, *et al*., 2010; Rosser, *et al.,* 2010; Dressler, *et al.,* 2010; Milner-Gulland, 2012; Amira, *et al.,* 2015; Venable, 2016; Bluwstein, 2017; Moyo *et al*., 2017; Sulle & Banka, 2017; Galvin, *et al*., 2018; Andika, 2020; Keane, *et al.,* 2020; Oduor, 2020). However, none of the studies dealt with community economic benefits gained in relation to different natural resources management approaches. Some of the literature touched on conservation and equity, though it was mainly governance and decision-making equity and less on economic benefiting. This is a literature gap that there is no comparison of different natural resources management approaches that address community economic benefit.

That identified literature gap created continuous conflicting decision on conservation approaches. One approach is supporting government-state-management, while the other supports communal-indigenous-management approaches. One approach supports consumptive resource utilization while the other supports non-consumptive resource utilization (McCormick & Fuwa, 2015; Sulle & Banka, 2017; Andika, 2020; Keane, *et al.* 2020). Furthermore, such a literature gap challenged decisions toward conservation of natural resources that enhance community economy welfare.

Because of that literature gap which was also identified by UNEP – WCMC report (2018), this research was carried out to improve understanding on application of different conservation theories. Moreover, the study will increase knowledge on relation of community economic welfare with natural resources management.

2.7 Conceptual Framework

There are three types of variables in these research namely dependent, independent, and intervening variables. All variables are derived from the cited reviewed literature and their relationship is shown in Figure 2.1 below.

Dependent Variable: Dependent variable is the one that is influenced by explanatory variables. In this research, it is community economic benefit (CEB). CEB is the sum of revenues or income, profit, creation of jobs, wealth creation, cash flow, material costs, opportunity costs, incentives, ecological benefits, and ecosystem productions.

Independent Variables: These are explanatory variables that determine the dependent variable which is terrestrial natural resources management approaches namely communal and government-management. Utilization models, control and development are sub-variables. Control and development variables comprise of decisions making, laws formulation, patrol, enforcement, and infrastructure development. While resources utilization variables are two models of consumptive and non-consumptive. Consumptives'composites are quota hunting, logging, food (meat and fruits), farming, medicine, firewood, and energy. Whereas non-consumptives'composites are grazing, recreation, tourism services of photographic

and game viewing, transportation, hotelservice, spiritual or ritual and scientific studies.

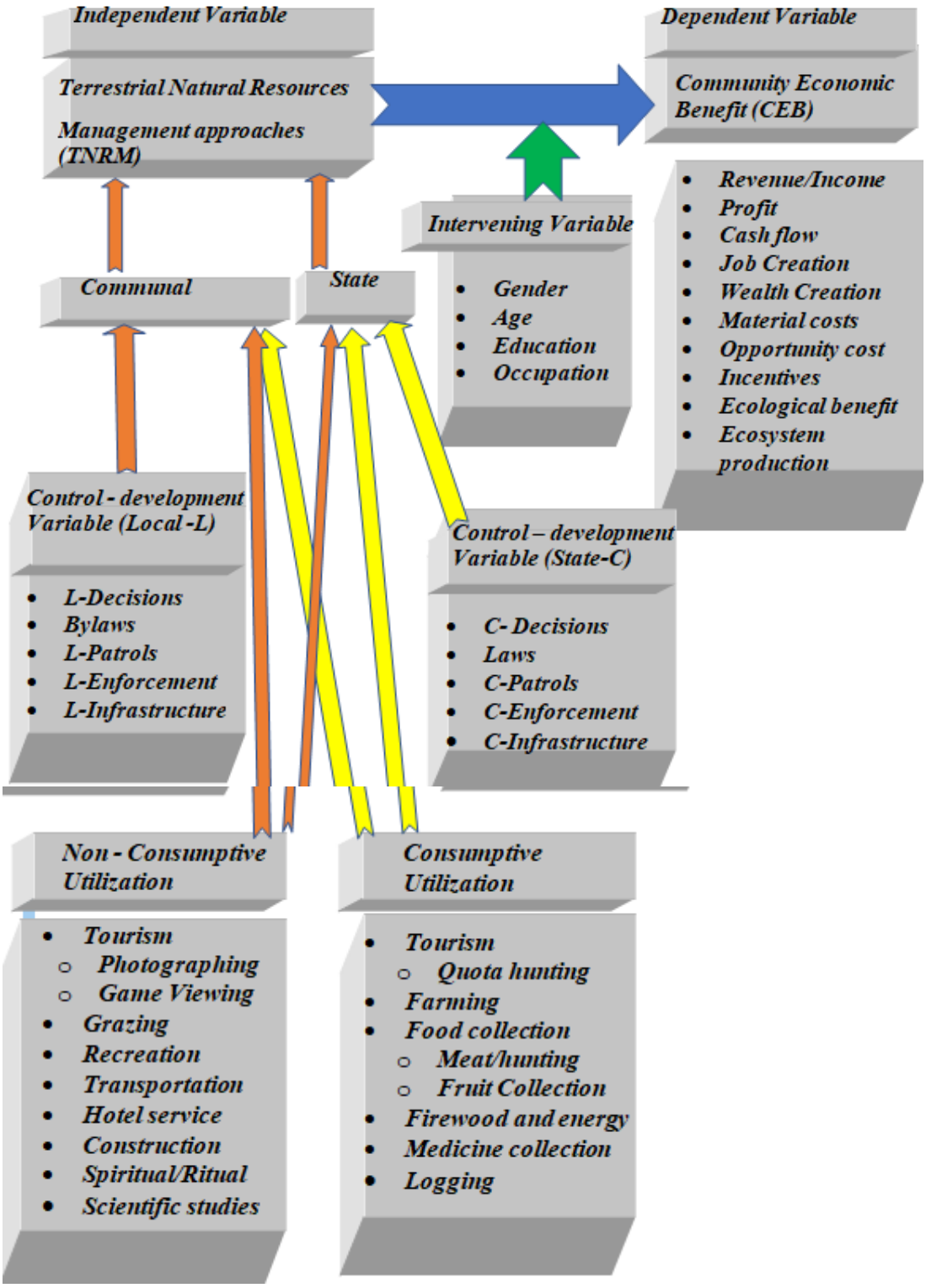

Figure 2.1: Graphical Conceptual Frameworks

Intervening Variables: These are variables that influence functions of independent variables. They have an indirect effect on dependent variables. In this research intervening variables are demographic issues that are gender, age, education, and occupation.

2.8 Chapter Summary

This chapter provided a critical review of the literature. Conceptual definitions, theoretical literature review, empirical literature review, and related policies. Research gaps were identified, and a conceptual framework was developed. The next chapter will be research methodology. The next chapter will state research philosophy, strategy, sampling area and population, data collection, and data analysis. The following chapter will also state the validity, reliability of the method, and ethical considerations for this study.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Chapter Overview

This chapter explains applied research philosophy, strategy, and study area. Also, it explains sampling design, data collection methods and data analysis methods. The chapter also shows expected results and how data are presented. Validity, reliability, and finally ethical considerations carried are enlightened in this chapter.

3.2 Research Philosophy

This research has adopted and applied doxology to epistemology (believed things into known things) philosophy. The philosophy was adopted because the study applied a hypothesis that was a thoughtful thing while conclusions depended on research scientific findings that are facts and known things. The research used constructivist philosophy that combined empirical, expertise, and positivist approaches in line with Novikov & Novikov (2013). Great philosophers Plato and Aristotle's positivist approach to survey, which, is a scientific approach have been adopted and used. This philosophy was selected because research grounds believed that reality is stable, fixed, can be observed, and can be applied in a similar environment. Moreover, interpretivism of reviews on expert knowledge and conducted studies has been used to avoid methodological monism of one approach, and that improved research quality in line with Gravetter& Forzano (2012).

3.3 Research Strategies

The research strategy aligned with its positivism philosophy by applying a numerical scaled survey questionnaire and Key Informant Interview (KII) guide to collect

primary data. Scaled numerical instrument was used because its data can easily quantitatively analyze in statistical packages. KII was used to triangulate and complement information collected by a scaled survey questionnaire. The research also conducted relevant reviews on regional economic data as interpretivism. The research used descriptive quantitative statistics, statistical correlations, regression analysis and summarized KII information to produce relationship between dependent and independent variables as stated by Gravetter& Forzano (2012). The research assumed that human behavior and choice are predictable, therefore response was realistic.

3.3.1 Area of the Research

3.3.1.1 Greater Mahale Ecosystem Location

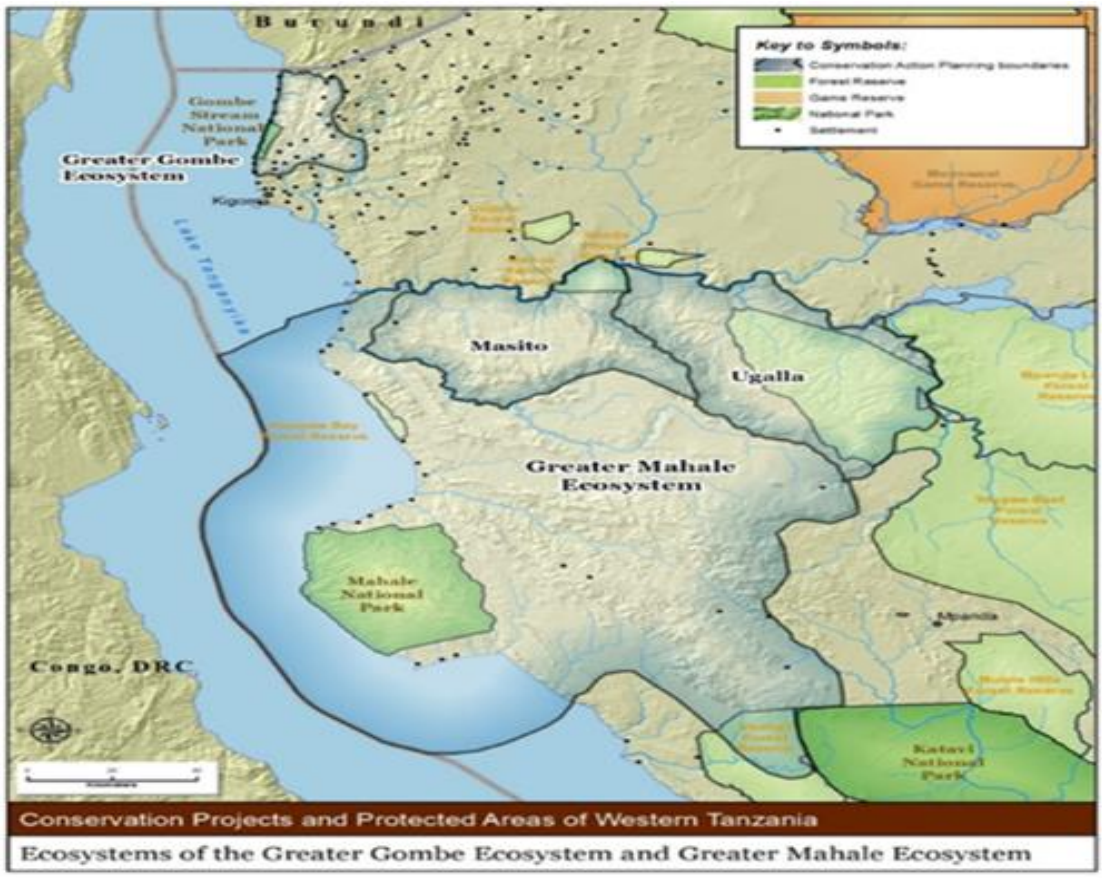

Figure 3.1: Map of Greater Mahale Ecosystem

This study was carried out in Greater Mahale Ecosystem which is part of the West Tanzania ecoregion (John, *et al.,* 2019). The area is a landscape that covers 18,200 Km² sited at Latitude 50.30' - 6^0.29' South and Longitude 29^0.43' - 30^0.37' East (Coulter, 1994). The area is bordered by natural features as seen in Figure 3.1 below. To the West, is ancient Lake Tanganyika, to the North is Malagarasi River, to the heart and South is undulating Mahale Mountains, while Ugalla River forms the Western border (TAWIRI, 2018).

3.3.1.2 Greater Mahale Ecosystem Topography

The Greater Mahale Ecosystem topography starts with the Albertine Rift valley's sharp features from Lake Tanganyika and Mahale Mountain (Coulter, 1994). The geography has steep hills, valleys, patches of seasonal swamps and rocky ridges. The area lies on Zambezian Woodland ecoregions which provide a natural attractive view. The variation in topographical features and the Albertine Rift made the area to be rich in biodiversity (Appendix VI) and it is one of 34 World biodiversity hotspots (TAWIRI, 2018). This is the only area in the world where chimpanzee habitat overlaps with savanna elephant habitat (TAWIRI, 2018).

3.3.1.3 Greater Mahale Ecosystem Climate

The Greater Mahale Ecosystem experience two main distinct annual seasons. The region has unimodal long rain season from November to April, and a dry season from May to October (CAP, 2011; TAWIRI, 2018). This kind of weather makes the region evergreen and conducive to wildlife habitat. Moreover, this climate makes the area suitable for both agriculture and grazing which are the main drivers for habitat degradation (William, 2018).

3.3.1.4 Vegetation Resources in Greater Mahale Ecosystem

The Greater Mahale Ecosystem (GME) is rich in vegetative and vegetative cover as seen in Figure 3.2. The Greater Mahale Ecosystem has open, drier, savanna and mosaic Zambezian woodlands. Moreover, the region has large territories of intact woodland characterized by *Brachystegia* spp. and *Julbernardia* spp. (TAWIRI, 2018). GME has corridor forests, wooded grasslands, and spacious zones of bamboo woodlands (Coulter, 1994). This variation of vegetation resources makes the area suitable for logging and farming. However, this beautiful vegetation resource is fast degrading at a rate of 10% per annum (William, 2018).

Figure 3.2: Vegetation cover and Nkondwe Waterfall

3.3.1.5 Water Resources in Greater Mahale Ecosystem

The Greater Mahale Ecosystem includes and is bordered by ancient Lake Tanganyika in the West. The lake hosts colorful ornamental fish commonly seen in aquariums but here are in their natural environment. The lake is home to more than 250 fish species most of which are endemic (Coulter, 1994). The region has major rivers such as Malagarasi in the North and Ugalla in the East. The area also has small riverine systems (Figure 3.2) that flow into Lake Tanganyika and some to Lake

Rukwa such as Katuma River (Figure 3.2). The Greater Mahale Ecosystem is the headwater of Congo basin (John, *et al.,* 2019). The water resources provide alternative livelihood and make the area attractive for tourism with some waterfalls and cool forests as well as suitable habitats for wildlife (TAWIRI, 2018).

3.3.1.6 Land resources in Greater Mahale Ecosystem

Land resources in Greater Mahale Ecosystem include undulating Mahale Mountains and beautiful land terrain. Moreover, there are mines (nickel, cobalt, and others). Wildlife such as 93% of Tanzanian endangered chimpanzees (2,800 in total) is hosted in this ecosystem (TAWIRI, 2018; Appendix VI). Savanna elephants, colobus monkeys and zebras freely interact in this area (Piel *et al.,* 2013; TAWIRI, 2018). The Greater Mahale Ecosystem land resources make the area attractive for wildlife-based tourism and mining activities regardless of its remoteness and less developed infrastructures.

3.3.1.7 Socio-Economic Activities in Greater Mahale Ecosystem

The Greater Mahale Ecosystem population is 500,000 native Ha, Bembe, Pimbwe, Konongo, Fipa and Tongwe. The population has poor performing economic welfare of less than 150 USD per year per household (URT, 2012). Greater Mahale Ecosystem population is growing at a faster rate of 4.8% than the average 3.3% Tanzania rate (Hardee, *et al.,* 2018). The fast population growth rate is contributed by high birth rate of 7.2 per woman and immigration (Hardee, *et al.,* 2018). Social-economic activities heavily depend on natural resource utilization including fishing, farming, and forest production (Hardee, *et al.,* 2018; Leisher & Hess, 2017). Other socio-economic activities are business, hotel, and tourism (Leisher & Hess, 2017).

The fast-increasing population and the heavy dependency on natural resources exert pressure on natural resource utilization.

3.3.2 Survey Population

Population is a totality of objects in the study (Gravetter& Forzano, 2012). Population in this study was 45 villages around Greater Mahale Ecosystem in Western Tanzania that practice natural resources management. Ten villages that had a total 7,214 households were picked out of 45 villages to ensure inclusivity of all conservation methods. Villages practicing or bordering with communally indigenous and government-state-managed land, wildlife, and forests were picked. Picked villages included Mwese, Lwega, and Lugonesi around Ntakata community forest scheme and Tongwe West district authority forest reserve.

Other villages were Buhingu, Mgambo, Katumbi, and Nkonkwa that border with Mahale Mountains National Park and have community forest reserves. Also, Kaseganyama, Kasangantongwe, and Kasekese were picked that are around government-state managed resources of hunting blocks and Nkamba forest reserve and have community forests. Isa research site was also included. These villages were purposively picked to ensure inclusivity of all natural resources management approaches. Such approaches included controls, development and utilization of natural resources models that are both consumptive and non-consumptive in the study area.

3.4 Sampling Design and Procedures

The study applied two stages sampling approach in selecting sample object (village) and sample unit household). To ensure inclusivity of all terrestrial natural resources

management practices, first stage sampling approach used non-probability purposive sampling in selecting 10 villages from the population. The population was 45 villages around Grater Mahale Ecosystem that practice communal-indigenous natural resources conservation or lives around government-state conserved areas. Natural resources management included national parks, forest reserves, hunting blocks, wildlife corridors and communities' forests.

Sampling procedure applied ensured inclusion of sample object from the population and adhered to a sample framework (Table 3.1). Second stage sampling was applied in picking household to interview. A probability simple random sampling (SRS) procedure was applied within the sampled village to select a sample unit which was a household. Selection of SRS method was to provide equal opportunity for any household in the community to be picked. Only one person in a household was interviewed to ensure wide inclusivity of community views.

3.5 Sample Size and Variables Measurements Procedures

This study had significant many independent variables; therefore, it applied Stevens (1996) multivariate statistics for social sciences studies to select sample size. Stevens (1996) approach was selected because it is a suitable method of calculating sample size when the study has many independent variables. The study used largest independent variable (m) to determine minimum sample size (N) by applying Stevens (1996) formula of N= 50 +8m for multiple linear regression (Stevens, 1996). In this study, the largest independent variables were 19, which were resources control and development (5), consumptive utilization (6) and non-consumptive utilization (8). Therefore, minimum sample size (N) = 50 + (8 X 19) =202.

Structured questionnaire was administered to 400 respondents with 40 respondents from each community as per sample framework in Table 3.1. This sample size of 400 respondents was significantly above 202 almost double, which should have been the Stevens (1996) minimum sample size. Making the sample size larger than Stevens' calculated sample size is because the larger the sample size the smaller the effect can be detected, while small samples can detect large effect size. The research wanted to ensure the detected effect is not contributed by a small sample size. In each sampled community 4 Key Informant Interviews (KII) were conducted including indigenous elders and community influential people, government officials and subject matter experts.

Table 3.1: Research Sampling Frame

	Communities around natural resources management areas				
Type	Wildlife corridor and studying block	Wildlife hunting block	Community forest reserve	State forest reserve	National Park
Households	40 X 2	40 X 2	40 X 2	40 X 2	40 X 2
KII	4X2	4X2	4X2	4X2	4X2
Total	Total Households 400				

Note: 2 villages were picked to ensure inclusion of each natural resource managed.

3.6 Methods of Data Collection

The study collected both primary and secondary data. Secondary data were collected from documents, reports such as Katavi and Kigoma region's income and revenue reports and publications related to economic benefiting from natural resources management. Primary data were collected by administering a structured questionnaire to 400 respondents and 40 Key Informant Interviews. In each community, 40 Households were picked, and scaled questionnaire was administered.

The selected mixed sampling approach was intended to attain community (villages) inclusivity and providing equal opportunities in picking respondents. All respondents were picked through Simple Random Sampling method within the sampling object (village). Key Informant Interviews (KII) was conducted with 40 people, 4 from each village administered questionnaire. KII respondents included indigenous elders and community influential people who had longer local knowledge in the area. Moreover, KII also included younger people who are involved in conservation-related livelihood activities such as forest game scouts (VGS). In each region (Katavi and Kigoma) one government official and natural resource officers were interviewed.

3.7 Data processing and Modeling

Descriptive statistics, statistical correlation and multiple linear regression techniques were used. Test of different statistical relationships between terrestrial natural resources management approaches (TNRM) and community economic benefit (CEB) calculated. Qualitative KII data were summarized by Excel framing method. Excel framing method was chosen because it is a simple analysing method when the qualitative data are not bulky. Qualitative information was used to triangulate and complement statistical quantitative information.

Resource utilization (RU) is composite of communal consumptive (CCT), communal non-consumptive (CNC), government consumptive (GCT) and government non-consumptive (GNC) resources utilization with disintegrated variables shown in Table 3.2. While resource control and development (CD) is composite of communal

control and development (CCD) and government control and development (GCD) with disintegrated variables shown in Table 3.2.

Mathematicaly, it is correct to state that:

i. CEB =*f*(Communal consumptive natural resources management) = *f*(CCT**).**

ii. CEB =*f* (Communal non-consumptive natural resources management) =*f*(CNC**).**

iii. CEB =*f* (Government consumptive natural resources management) = *f*(GCT**).**

iv. CEB =*f* (Government non-consumptive natural resources management) = *f*(GNC**).**

v. CEB =*f* (Communal natural resources management control and development) = *f*(CCD).

vi. CEB =*f* (Government natural resources management control and development) = *f*(GCD).

It is also mathematically correct to state that:

Community economy benefit (CEB) is the summation of economic gains and value (EV) and is the function (*f*) of terrestrial natural resources management approach (TNRM). Mathematically represented as follows: -

CEB = ∑(EV) and CEB = *f*(TNRM)…….……..... (1)

Whereby terrestrial natural resources management approach (TNRM) is the summation of resources utilization (RU) and natural resource controls and development (CD).

TNRM = ∑ (RU, CD) ……..……..……..……..…… (2)

RU is a composite of communal consumptive (CCT), communal non-consumptive (CNC) government consumptive (GCT), and government non-consumptive (GNC) resources utilization.

RU = ∑ (CCT, CNC, GCT, GNC) ……..…… (3)

CD is a composite of communal control and development (CCD) and government control and development (GCD)

CD = ∑ (CCD, GCD) ……..……..…….(4)

Inserting equation (3) and equation (4) into equation (2) gives equation (5) below: -

TNRM = ∑ (CCT, CNC, GCT, GNC, CCD, GCD) …… (5)

Then inserting equation 5 into equation 1, will produce equation (6) below: -

CEB = f {∑ (CCT, CNC, CCD, GCT, GNC, GCD)} ……..…….(6)

The composites in equation 6 can be termed as X_1, X_2, X_3.....X$\boldsymbol{t}$. The composites have constant regression terms to be generated or estimated $\beta_0, \beta_1, \beta_2, \beta_3 .... \beta t$, whereby β_0 = Regression coefficient, which is Y (CEB) value when all X (RU composites and CD) values are zero. When random error term of ε is applied, then equation (6) can be rewritten as follows:

CEB = $\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 +$……+ βtX$\boldsymbol{t}$+ εi…….……...…….. (7)

And therefore, equation 7 can be re-written as follows: -

$CEB = \beta_0 + \beta_1 CCT + \beta_2 CNC + \beta_3 CCD + \beta_4 GCT + \beta_5 GNC + \beta_6 GCD + ... + \varepsilon i ...$ (8)

Equation (8) is the model of terrestrial natural resources management (TNRM)–community economic benefit (CEB) in this study. Equation (8) was used to compute impact of terrestrial natural resources management approaches on community

economic benefit as stated in all 7 objectives of the study.

Table 3.2: Resource Utilization (RU) and Control – Development (CD) Variables

Consumptive Utilization	Code	Non-Consumptive Utilization	Code	Control development	Code
Tourism hunting	(TH)	Photographing game view	(PG)	Decisions	(LD)
Farming	(FM)	Grazing	(GZ)	Bylaws	(BL)
Food meat and fruit	(MF)	Recreation	(RC)	Patrols	(LP)
Firewood and energy	(FW)	Transportation	(TP)	Enforcement	(LE)
Medicine	(MD)	Hotel service	(HS)	Infrastructure	(LI)
Logging	(LG)	Infrastructures	(IF)		
		Spiritual	(SP)		
		Scientific studies	SC		

Note: Code = Short form used in the TNRM -CEB model equation 8 are in brackets.

Research conclusions on hypothesis in this study applied and relied on common 95% confidence interval and p-value especially in accepting or rejecting the null hypothesis. Whenever p-value was less than 0.05 (< 0.05), it was considered insignificant and sufficient statistical evidence against the null hypothesis therefore null hypothesis was rejected, in favour of the alternative hypothesis. Moreover, whenever confidence interval had no inclusion of null value (x=0), that was used as sufficient evidence against the null hypothesis in favour of the alternative hypothesis may be true.

3.8 Measuring Scale and Interpretation

This study applied a four-point scale scoring questionnaire in line with Parrish *et al.* (2003) and Stacey, *et al.* (2013) in ecological studies. The study used a four-point scale to avoid bias and respondents clustering at center (Stacey *et al.*, 2013). Furthermore, different natural resources management approaches such as communal or government and consumptive or non-consumptive approaches have been assessed

to avoid framing effect in assessment (Cook *et al.,* 2014). For all tested variables, a four-point scoring scale were from 1, strongly disagree; 2, disagree; 3, agree and 4 strongly agree in line with Parrish, *et al.,* (2003).

Descriptive statistics and central tendency such as the mean and standard deviation were calculated and used to interpret result (Table 3.3). Correlations between terrestrial natural resources management approaches (TNRM) and community economic benefit (CEB) were analyzed through SPSS to produce Pearson (r). Qualitative collected data were summarized by Excel framing summarizing method and used alongside analyzed quantitative data. Application of both quantitative and qualitative data collection complemented and triangulated the research finding that improved research quality.

3.8.1 Correlation using Pearson Product-Moment

The Pearson product-moment correlation coefficient, or simply Pearson's r, which is a covariance statistical relationship correlation coefficient was calculated for each composite in this study. Pearson r was calculated to test association between each composite of terrestrial natural resources management approaches (TNRM) and community economic benefit (CEB). Pearson's r showed magnitude of the association and direction of the relationship. The relationship was considered a high degree of association and very strong when it ranged from ±0.7 and <+1>-1, moderate when it ranged from ± 0.4 and <+0.6>-0.6, and weak when it ranged from ±0.1 and<+0.3>-0.3 in line with Almquist, Ashira & Brännström (2019) and Profillidis & Botzoris (2019).

Table 3.3: Data Processing Matrix

Variables	Items	Measurement	Interpretation of mean (M) by weak (Wk) and strong (St)
Economic benefits	**42**	**Scale 42 – 168**	**If M ≤ 83Wk; > 83St**
Revenue- Income	7	Scale 7 – 28	If M ≤ 13 Wk; >13 St
Profit	5	Scale 5 – 20	If M ≤ 9 Wk; >9 St
Cash flow	4	Scale 4 – 16	If M ≤ 7 Wk; >7 St
Job Creation	5	Scale 5 – 20	If M ≤ 9 Wk; >9 St
Wealth Creation	5	Scale 5 – 20	If M ≤ 9 Wk; >9 St
Material costs	4	Scale 4 – 16	If M ≤ 7 Wk; >7 St
Opportunity cost	5	Scale 5 – 20	If M ≤ 9 Wk; >9 St
Incentives	3	Scale 3 – 12	If M ≤ 5 Wk; >5 St
Ecological	4	Scale 4 – 16	If M ≤ 7 Wk; >7 St
Integrated resource utilization	**41**	**Scale 41 – 164**	**If M ≤ 81 Wk; > 81 St**
Consumptive	**17**	**Scale 17 – 68**	**If M ≤ 33 Wk; >33 St**
Tourism hunting	2	Scale 2 – 8	If M ≤ 3 Wk; > 3 St
Farming	4	Scale 4 – 16	If M ≤ 7 Wk; >7 St
Food Meat and Fruit	3	Scale 3 – 12	If M ≤ 5 Wk; >5 St
Firewood and energy	3	Scale 3 – 12	If M ≤ 5 Wk; >5 St
Medicine	2	Scale 2 – 8	If M ≤ 3 Wk; > 3 St
Logging	3	Scale 3 – 12	If M ≤ 5 Wk; >5 St
Non- consumptive	**24**	**Scale 24 – 96**	**If M ≤ 47 Wk; >47 St**
Photographing and Game and Viewing	4	Scale 4 – 16	If M ≤ 7 Wk; >7 St
Grazing	4	Scale 4 – 16	If M ≤ 7 Wk; >7 St
Recreation	3	Scale 3 – 12	If M ≤ 5 Wk; >5 St
Transportation	2	Scale 2 – 8	If M ≤ 3 Wk; > 3 St
Infrastructures	3	Scale 3 – 12	If M ≤ 5 Wk; >5 St
Hotel service	4	Scale 4 – 16	If M ≤ 7 Wk; >7 St
Spiritual/Ritual	2	Scale 2 – 8	If M ≤ 3 Wk; > 3 St
Scientific studies	2	Scale 2 – 8	If M ≤ 3 Wk; > 3 St
Control and development	**12**	**Scale 12 – 48**	**If M ≤ 23 Wk; > 23 St**
Decisions making	2	Scale 2 – 8	If M ≤ 3 Wk; > 3 St
Bylaw's formation	3	Scale 3 – 12	If M ≤ 5 Wk; > 5 St
Patrols	3	Scale 3 - 12	If M ≤ 5 Wk; > 5 St
Enforcement	2	Scale 2 – 8	If M ≤ 3 Wk; > 3 St
Infrastructure	2	Scale 2 – 8	If M ≤ 3 Wk; > 3 St

Source: Field Data, (2020).

3.9 Validity and Reliability

This study performed multicollinearity statistical pair-wise correlation tests among variables in line with Gujarati (2004) to ensure no correlation between independent variables. Results were less than 0.5 and were considered fine. Furthermore, a

statistical test for reliability and internal consistency of variable relations were performed by calculating Cronbach Alpha by using SSPS software in line with Heo, *et al.*, 2015. In this study, the minimum or cut-off point Cronbach Alpha was 0.7, because Cronbach Alpha of 0.7 and above is commonly considered good and acceptable for reliability and internal consistency of variable relations, then it was accepted (Almquist, Ashira & Brännström, 2019).

3.10 Ethical Considerations

The researcher informed respondent's purpose of the study. There was neither promise, token, or gift given to respondents neither before nor after the interview. Therefore, respondents participated in the study voluntarily and neutrally. Respondents were assured of information confidentiality, privacy and that the result was to be used for study purposes only. To maintain privacy and confidentiality, the research result refrained from mentioning respondents' names even in Key Informant Interviews results. Respondents informed that they could withdraw from the interview at any point when they wished to do so. Respondents were assured that there was no negative consequenceby opting to withdraw. Even though respondents had that assurance, none of them withdraw from interview. Cited literature and source of secondary information had been acknowledged.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Chapter Overview

This chapter presents and discusses the research analyzed data and study results. To enable the reader, to comprehend the discussion, this chapter is organized into eleven sections. The first and second section describes overview and demographic information of respondents. The third section discusses general impact of natural resources management on community economic benefit. The fourth to ninth section discourse the research objectives which are impact of different terrestrial natural resources management approaches (TNRM) on community economic benefit (CEB). The tenth section presents hypothesis testing for all 6 research objectives. The last section discusses a comparative analysis of the models that respond to objective 7. Information presented by using descriptive statistics, correlation, and regression Tables and Figures as well as discussions. Discussion enriched by firsthand information from summarized Key Informant Interviews (KII).

4.2 Demographic Information

Respondent's background information was collected by using part A of the quantitative questionnaire and presented in Figure 4.1. This information was important to help readers understand the wider respondent's inclusivity of gender, occupation, age, and education. Out of 400 respondents interviewed, 57.8% were men and 42.3% were female. The data showed reasonable gender views and opinions representation. Respondents' age segregation showed 17% were below 45 years which means relatively less historical experience, while majority of respondents (83%) were above 45 years which meant long institutional memory.

This suggested that majority of respondents (83%) had long-time experience in the area and were knowledgeable on natural resources management approaches and their impact on their local community economy. Majority of respondents had primary education (65.8%), which suggested most of their economic activities were linked to natural resources which are a common situation in rural Tanzanians in line with URT (2012) and Leisher & Hess (2017). Furthermore, the study considered secondary education as elite. Respondents with secondary and above education were 34.3%. The data suggested fair inclusion of both elite view and non-elite views on reasoning of issues that relatet o natural resources management to their local economy.

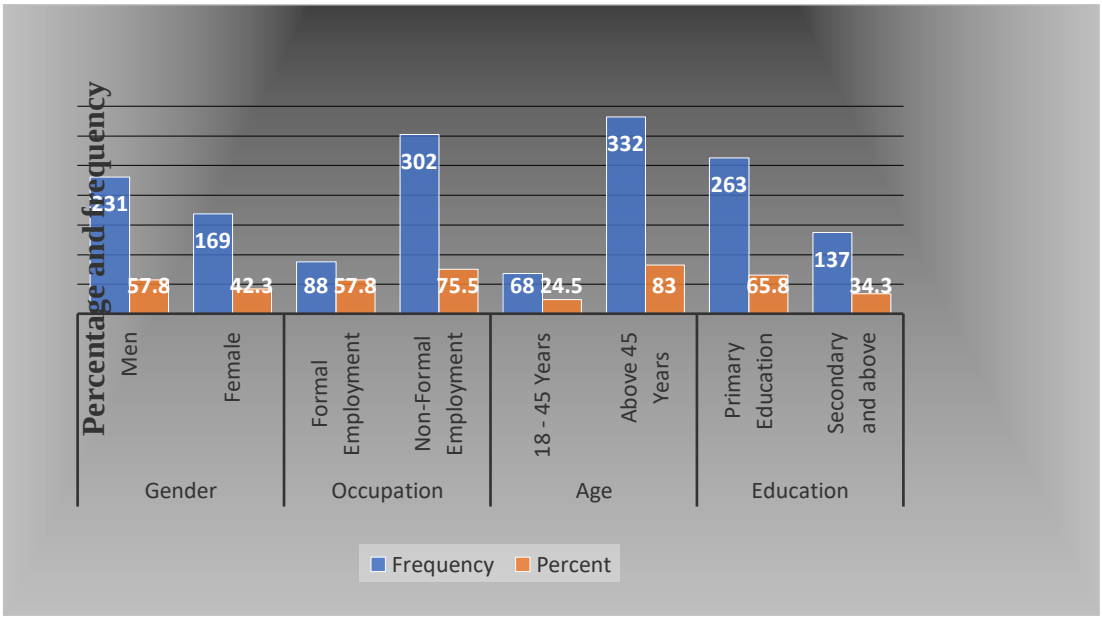

Figure 4.1: Background Demographic Information of Respondents

4.3 Impact of Natural Resources Management on Community Economy

4.3.1 Section Overview

This subchapter presents and discusses impact of natural resources management on community economy around Greater Mahale Ecosystem by using economic variables. In this section descriptive statistics mainly mean and qualitative data are

used to present the extent of impact. Graphs and Tables are used to present findings.

4.3.2 Conservation Economic Value

Natural resources management's impact on community economy has been tested by producing conservation economic value. Total community economic benefit (CEB) computed mean was 102.7 (Table 4.1) which was 19.7 points above average strong mean of 83 (Table 3.3). Although the Greater Mahale Ecosystem is remote, and one could expect weak community economic benefits as stated in URT (2012) and in Leisher & Hess (2017), the result suggested a strong impact of community economic benefit (CEB) gained from natural resources management. One, elderly resident who has lived in the village around Greater Mahale Ecosystem affirmed this when asked about potential conservation community economic benefits, he said:

> *"in these years, we make more money from selling agricultural produce especially cotton which was not the case for some years ago".*

Moreover, the area experience increasing natural resources economic benefits such as payment on avoided deforestation and forest degradation REDD+ carbon credit. Interviewed people affirmed increasing avoided REDD+ carbon credit benefits. One famous community member from Ntakata forest village around Greater Mahale Ecosystem when asked about benefit of forest conservation, said:

> *"We see value of our forest by selling avoided carbon credit which we never sold in past years. In Lwega village, we have increased our village forest to benefit more avoided deforestation carbon payments; because the bigger the forest you have the more money of avoided deforestation carbon credit you receive".*

This information showed that increased natural resources management has benefited community economically and motivated community to set aside more forests for

conservation. The information was in line with the IUCN report (2017) which said, when people benefit from resources, they value them. However, some other community members had a slightly opposing view whereby agriculture expansion was viewed to have a negative impact on forest reserves. One concerned prominent cotton farmer said:

> *"In these years, we are experiencing agriculture farming expansion and forest encroachment than all past years that reduce our forests".*

The information was in line with Steffen *et al.* (2015) who said agricultural activity is among the leading cause of land domestication. These findings suggest further review of how agriculture expansion is related or balanced with forest conservation and natural resources community economic benefit.

Table 4.1: Impact of Conservation on Community Economic Benefit

Conservation economic benefits	Sum	Mean	Std. Deviation
Gained revenue and income	13607	18.56	4.303
Gained profit in community	9190	12.54	3.321
Cash flow in community	7160	9.77	2.775
Job creation in community	7160	9.77	2.775
Wealth created in community	7441	10.15	3.994
Material cost reduction in community	5978	8.16	3.465
Opportunity cost in this community	9789	13.35	3.157
Incentives paid or gained in community	6384	8.71	1.655
Ecological benefit gained	8182	11.16	2.047
Community economic benefit	74891	102.17	23.112

Note: N=733. Calculated total mean (102) is higher than 83 for the strong mean (Table 3.3).
Source: Research Data, (2022).

4.3.3 Income and Cashflow

An increase in household income, profit and cash flow in the Greater Mahale Ecosystem communities were mentioned among impacts of natural resources management. Gained conservation revenue and income calculated mean was 13.56

(Table 4.1) above the strong mean of 13 (Table 3.3). Whereas the profit computed mean was 12.54 (Table 4.1) above the strong mean of 9 (Table 3.3). While cashflow calculated mean was 9.77 (Table 4.1) above the strong mean of 7 (Table 3.3). Feelings and opinions of interviewed key informants affirmed that natural resources management impact community economic benefit.

One popular woman who was born in one village and married in a different village around the Greater Mahale Ecosystem when asked about household income and affordability of meals from natural resources management, said: *"In our families, we eat good meals with fish and meat".*

This implied that they afford a good meal that cost money for either fish or meat. Moreover, one young man who conduct forest patrols in Greater Mahale Ecosystem, when asked about economic benefit and the ability to purchase and own smartphone, smiley showed that they have a good income and can afford quality purchase, as he was pointing out his phone, said:

> *"Most of us youth and few elders buy and have modern touch smartphones as you can see. Nowadays unlike the past days, we have solar powers, where we charge our phones and there is network connectivity in our villages".*

Impact of gained natural resources management income and profit was linked to availability of agropastoral markets that enable exchange of goods. One elderly agropastoral who lived in the area soon after Tanzania's independence had positive views on profitability and cash flow, when asked about presence ofan improved market for their goods, he said:

> *"We have better agricultural, and livestock markets now compared to past years where we sell our cotton, and livestock at a good price".*

> He added, *"We now sell milk in good amounts, which we used to only drink and sell very little".*

However, there were slight reservations about the income gained, and profitability reported due to challenge of poor road network, accessibility, and inconsistent market. Inconsistent markets made community not to gain stable income. One elderly agropastoral who lived in the area soon after Tanzania's independence said:

> *"We sometimes throw away our milk and some livestock keepers in the forest do not sell all their milk because sometimes there are no vehicles to carry milk to market and during rainy season the road is not passable. Due to poor roads during rainy season, last year we delayed selling our cotton".*

The information coincides with small, realized impact of natural resources management on wealth creation. Wealth creation computed mean was 10.15 (Table 4.1) just above the strong mean of 10 (Table 3.3). The findings insinuate that even though communities make profit and income, there are fewer servings for wealth creation.

4.3.4 Conservation Incentive Payment

Impact of natural resources management on conservation incentive payments ranked high in Greater Mahale Ecosystem. Incentive paid or gained mean is shown to be 8.71 (Table 4.1) above the strong mean of 5 (Table 3.3). Economic benefit incentives include payment on avoided deforestation and degradation REDD+ carbon credit, school construction, and road construction. The gained conservation incentives were affirmed by interviews. One popular woman in Ntakata villages at Greater Mahale Ecosystem when asked about forest conservation economic benefit, she linked it with avoided deforestation REDD+ carbon credit payment, she said:

> *"We enjoy avoided deforestation and forest degradation carbon credit payment. We received 1.3 billion Tanzania Shillings for a period of 6 months as a conservation payment that we used to pay for whole community health insurance, build a pharmacy and renovated classrooms".*

In addition, one government officer at Tanganyika District also linked conservation economic benefit with avoided deforestation and forest degradation carbon credit incentive when asked about economic importance of forest conservation, he said:

> *"As a District Council we received 130 million Tanzania Shillings for selling avoided deforestation and forest degradation carbon offset for a period of six months that we will use to enhance conservation and other community services".*

Conservation economic incentives were noted in community development programs implemented by National Parks. National Parks support community development work like school or health facility construction. One popular member who is a member of forest patrol team at Lake Tanganyika coast village around Mahale Mountains National Park, when asked about conservation economic benefit, he said:

> *"Mahale Mountain National Park constructed a secondary school dormitory and dining hall in our Buhingu secondary. They also constructed bridges and roads that increased accessibility in our community".*

Use of nature-based solutions (NBS) such as payment on avoided deforestation and forest degradation carbon credit is part of the wise use of natural resources. Conservation supporters concur with this view by arguing that wise use of resources, increases ecosystem services function and in turn creates flow of income (Tchakatumba, *et al.*, 2019; Andika, 2020).

4.3.5 Ecosystem Service and Opportunity Costs

Natural resources management impacted improved and maintained ecosystem service with fewer opportunity costs in Greater Mahale Ecosystem. Ecological and

ecosystem service benefit calculated mean shown to be 11.16 (Table 4.1) above the expected mean of 7 (Table 3.3). Ecological benefit was associated with climate change mitigation and adaptation. Moreover, it is related to ecosystem services such as enjoying clean air and water availability. Clean air ecological benefits declared by community interviews. One interviewed indigenous respondent who was born and grew up in the area and is a leader in a community-based conservation organization when asked about forest conservation benefits, said:

> *"We enjoy and breath clean air from our forests no wonder why our community is healthy".*

Furthermore, climate-related ecological benefit such as receiving enough rain or river water was acknowledged through interviews. One interviewed agropastoral young woman married from central Tanzania to lower land village of Greater Mahale Ecosystem 15 years ago, when asked about forest conservation benefits, she said:,

> *"We receive enough rainfall that enables us to have good agricultural harvests and livestock pastures".*

The information agrees with fathers of conservation, Professor Leopold in Darling (1964) that a healthier interaction and wise use of resource will benefit ecology and human being who are part of it (Darling, 1964; Bluwstein, 2017; Russell *et al.*, 2018). However, detailed community ecological benefits need to be studied.

With all the economic benefits gained from management of natural resources, there are opportunity costs incurred. Opportunity cost calculated mean was 13.35 (Table 4.1) above the strong mean of 9 (Table 3.3). Although it was expected community to report high incurred opportunity costs for conservation, the difference is not very

big. The data implied that community has enough land and forest for other uses. However, there were some hesitative views from some interviewed people. One interviewed famous indigenous farmer who lived long in the area had a concern and worries about immigrants and enough arable land, when asked about economic conservation benefit, he said:

> *"We receive many pastoralist immigrants mainly from central Tanzania because our land is good for grazing and farming. Additionally, we are not so much afraid of these newcomers because we have land use plans that will protect our forests,".*

The finding shows that community knows value and benefit of their natural resources. This finding is in line with Ostrom (2010) and Russell*et al.* (2018) who showed that communities will value resources they benefit from. The result also suggests that there is less awareness on opportunity costs incurred due to natural resources conservation.

4.3.6 Job creation and other Conservation Benefits

Natural resources management in Greater Mahale Ecosystem had impact on job creation and reduction of material costs. Job creation computed mean was 9.77 (Table 4.1) slightly above strong mean of 9 (Table 3.3). However, there was apprehensive on job creation. Interviewed community showed concern about fewer job opportunities, which, they linked to small number of tourists and poor road infrastructures. One interviewed trained forest patrol young man had this to say when asked about economic benefit of job opportunities and tourism business, he said:

> *"We have fewer job opportunities in villages compared to town even though now some youths are recruited as village game scouts (VGS),*

> *who are paid monthly from avoided carbon credit scheme".* He added *"we receive few tourists because our villages are remote with less developed road infrastructure that hinder us to make tourists supporting jobs".*

Another conservation impact on community economic benefit included material cost reduction. Material cost reduction computed mean was 8.16 (Table 4.1) above the strong mean of 7 (Table 3.3). Less material costs especially construction materials were noted in the area. Community perceived to have less material costs which enabled them to afford construction of new buildings. One respectful interviewed retired officer at Lake Tanganyika coastal village in Greater Mahale Ecosystem responded when asked about accessibility of different materials especially construction materials, he said:

> *"We have hardware in our villages, where we access construction materials such as cement and iron sheets. The reduced material costs enabled us to install more solar power and use TVs"*

Material cost reduction was linked with road connectivity from villages to towns. Such roads from Kalya to Kigoma and roads from Lugonesi to Mpanda were considered as a key factor in improving business. Road connectivity has also enhanced transportation. This finding was confirmed by an interviewed community member when was asked about business development. One famous businessperson who lives in the Greater Mahale Ecosystem coastal village of Lake Tanganyika responded to the interview by saying:

> *"Our businesses have improved after having road connectivity and road transport to town. Opening a road from Kigoma to Sigunga simplified our business transactions. The current opening of that road to Kalya and the construction of a road to Kalelani is enabling us to transact without waiting for boats (*meant without using Lake transportation*). Moreover, the current opening of the road from Rukoma to Mwese and Mpanda gives us a choice of shopping either*

at Kigoma or at Mpanda."

However, business development and other economic benefit such as transportation and connectivity infrastructure are still less developed compared to another part of the Country (Tanzania). Yet there is significant improvement compared to the recorded development levels by Tanzania census of 2012 (URT, 2012). Also, current development is beyond recorded development in study conducted by Leisher and Hess (Leisher & Hess, 2017).

4.4 Objective 1 Results: Impact of Communal-Indigenous Consumptive Natural Resources Management on Community Economic Benefit

4.4.1 Section Overview

This subchapter presents and discusses communal–consumptive natural resources management impact on community economic benefit findings. Variables of communal-consumptive management are presented. Descriptive statistics of mean are used. Findings are presented by Tables, graphs and qualitative data.

4.4.2 Impact of Communal-Indigenous Conservation on Community Economic Benefit

Greater Mahale Ecosystem applies a communal-indigenous natural resources management approach among others. Consumptive utilization of natural resources mainly forests, and wildlife resources included hunting tourism, access to timber, firewood, wild game, wild fruits, and medicinal trees and wildlife. Communal-indigenous natural resources management consumptive utilization had impact on community economic with a mean of 31.17 (Table 4.2) which was slightly below strong mean of 33 (Table 3.3). The data suggested existence of weak impact

relationship between communal-indigenous consumptive natural resources management on community economic benefit. Weak communal-indigenous consumptive natural resources mean was associated with poorly developed infrastructure and attested by interviewed people. One interviewed natural resources government officer employed in one district around Greater Mahale Ecosystem for more than ten years, when asked about communal-indigenous consumptive utilization economic benefit, his response was:

> *"Community has weak governance and cannot make strong resources extractive plans".* He added, *"Community cannot develop road infrastructures even to places where they wish to extract resources".*He completed by saying *"therefore, community cannot realize tangible consumptive natural resources benefit without support of district government".*

The mentioned main reason that causes less impact of consumptive communal natural resources management on economic benefit was poor road network and accessibility. One interviewed trained forest patrol young man when asked about economic benefit gained from communal consumptive approach, he showed concern, by saying:

> *"We receive few hunting tourists, and it is difficult to sell our timber at good price because our villages are remote with less developed road infrastructure".* He added; *"Our hunting blocks are also poorly functioning because of poor roads and therefore, hunting tourists do not prefer to come to our area".*

The findings on challenges of infrastructure and remoteness align with Huton, *et al*., (2005) who showed that channels of gains in economic benefit face barriers and boundaries. Such barriers include accessibility like what is experienced in Greater Mahale Ecosystem.

Table 4.2: Communal-Indigenous Consumptive approach Variables

Variables-composites	Mean	Std. Deviation	N
Communal consumptive	31.17	11.858	733
Hunting tourism	3.23	1.521	733
Farming	7.23	2.737	733
Meat and fruits	5.07	2.316	733
Firewood	5.78	2.488	733
Medicinal	4.59	2.068	733
Logging and timbering	5.27	2.359	733

Note: N=733.

4.4.3 Hunting Tourism in Communal conserved Areas

Impact of communal-indigenous hunting tourism on community economy in and around communal forests, wildlife corridors and wildlife dispersal areas computed mean in Table 4.2 was 3.23. The studied mean was just above strong mean of 3 (Table 4.3). The data suggests existence of strong relationship. The numbers insinuate that hunting tourism is happening in the community-managed blocks as well. However, majority (75.3%) and (62.8%) disagreed that hunting blocks are active and hunting quota permits are issued respectively (Figure 4.2).

The quantitative findings speak same language as qualitative interview opinions. One elderly respective person in one lower village of the area, which is not participating in avoided deforestation carbon credit business, was interviewed. When he was asked on performance of hunting blocks in community lands, he had reservations and hesitation on whether they benefit economically. He cited and mentioned Lyamgoloka which is a wildlife corridor connecting Mahale Mountain National Park and Katavi National Park by saying:

> *"Setting aside land for hunting blocks is not promoting our community economy because there are no hunting tourists. We do not receive money for conserving our communal land for hunting".* He

added, *"for example, I do not know what money and benefit we get for conserving Lyamgoloka".*

The finding and feeling call for enhanced resources utilization that addresses community economic benefit. That concurs with Keough and Blahma (2006) and Russell*et al.* (2018) argument which says resources should be in community custodianship to be utilized in a more rewarding way.

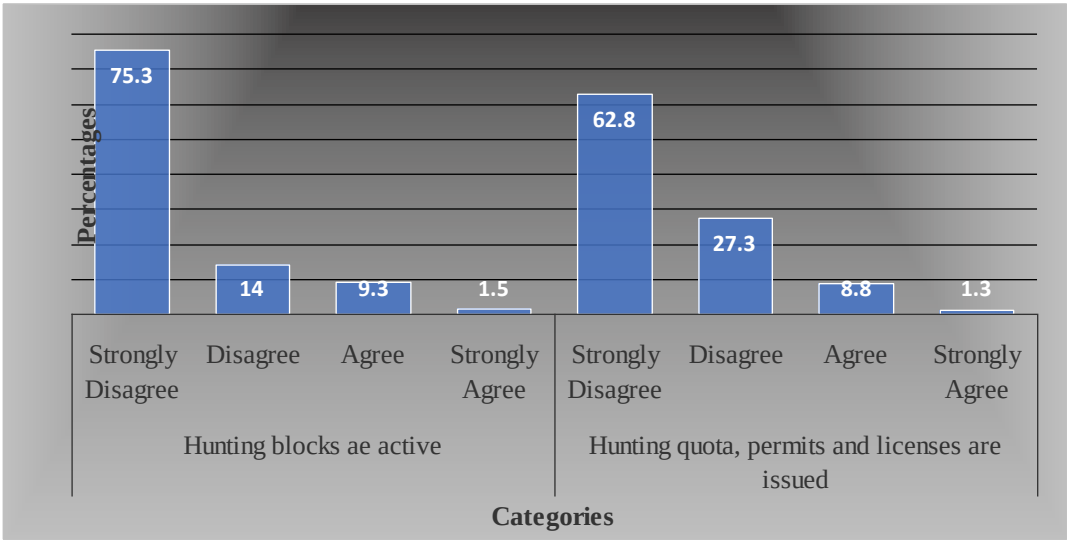

Figure 4.2: Hunting Tourism in Communal-Indigenous conserved Areas

4.4.4 Farming near Communal conserved Areas

Impact of farming near communal forests and wildlife corridors on community economy under communal-indigenous natural resources management approach was slightly strong with a computed mean of 7.23 (Table 4.2). The studied mean was just slightly 0.23 points above strong average mean of 7 (Table 3.3). The data suggests not a very strong impact. Majority of respondents (75%) strongly disagreed on all points that farming near communal conserved areas such as forests and wildlife corridors produces more harvest. More than half of respondents (63%) disagreed with whether there is availability of enough water for farms. Furthermore, close to

half (43%) of respondents disagreed that they receive good farm get prices and 44% of respondents disagreed that crops destroyed by wildlife are compensated (Figure 4.3). This was a skewed finding with majority disagreement. This finding suggests pessimism for conservation on acceptance of land use for agriculture.

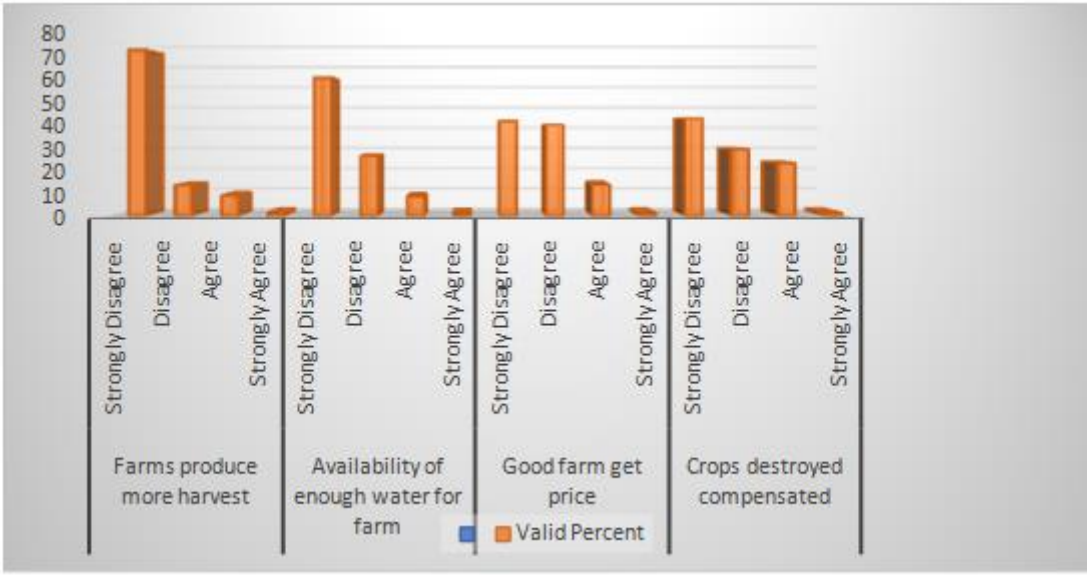

Figure 4.3: Percentage on Farming near Communal – Indigenous Conserved Area

4.4.5 Game and Fruits Access in Communal Conservation

Conservation impact on community economic benefit was studied through availability and access of meat–wild game and fruits for use in communal-indigenous managed resources approach. Studied natural resources included communal forests and wildlife corridors that had a computed mean of 5.05 (Table 4.2) almost close to the strong mean of 5 (Table 3.3). Respondents disagreed on the availability of enough fruits for selling were 63.5%. More than half (63%) disagreed with access to enough fruits for food and 74% disagreed with the availability of enough bush meat (Figure 4.4).

The quantitative finding suggests that communities rely less on wild game and wild fruits either for food or for business like for sale. The information was confirmed by interviewed people. One elderly Tongwe tribe man when asked on access to fruits and wild game, he said:

> *"There is enough food in our community and traditionally we do not depend on wild fruit and bush meat for food. We normally do not hunt wild games like newcomers to our land".*

Furthermore, one government official from one district of Greater Mahale Ecosystem when asked about community access to wild fruit and wild games for food, he said:

> *"Our region is among of country food basket regions, and we always have good agricultural harvest. People less rely on wild fruit and meat".* He added by saying, *"although we opened wild game meat butcher in some towns like Mpanda, most people who purchase that meat are not indigenous people".*

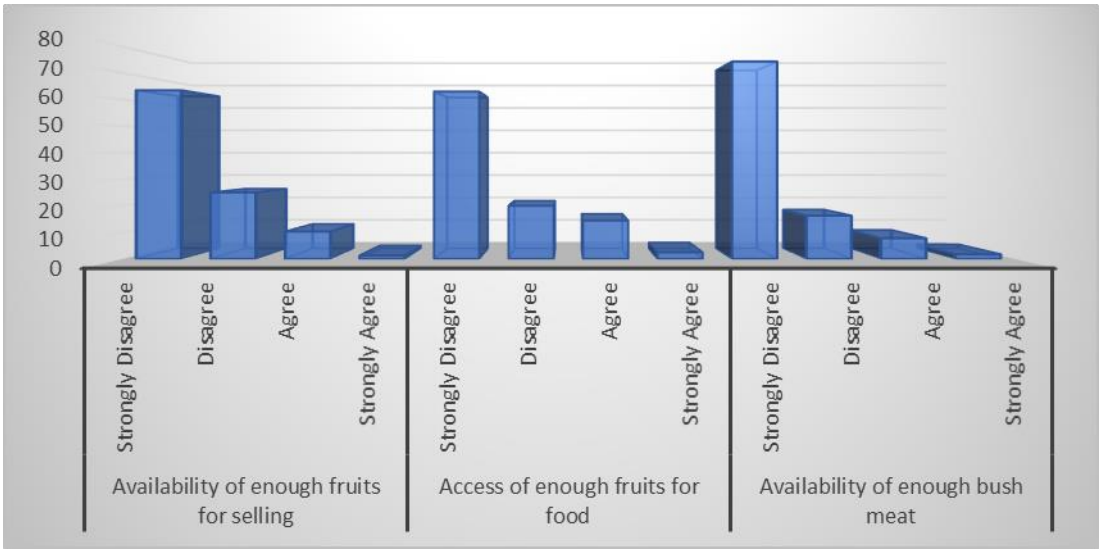

Figure 4.4: Percent on Fruits and Meat availability in conserved Areas

4.4.6 Firewood and Timber access in Communal Managed Forests

Impact of access to firewood and energy from communal-indigenous managed natural resources approach on community economy computed mean was 5.78 (Table

4.2) slightly above strong mean of 5 (Table 3.3). The mean was not very strong. The data suggested that communities depend less on communal forests to access firewood. The information was confirmed by interviewed people. One interviewed an elder woman in one of the area villages, when asked about access to firewood for energy, she said:

> *"There are enough trees for firewood in our village. We get firewood from our farms and other non-conserved forests that are general lands and not from conserved forests".*

Whereas impact of logging and timbering on community economy computed mean was 5.27 (Table 4.2) just 0.27 points slightly above average mean of 5 (Table 3.3). The findings suggested less economic benefit gained through logging and timbering in communally managed forests. The finding was confirmed by interviews. One interviewed respectful person who is a retired government officer on shores of Lake Tanganyika, had this to say when interviewed on forest logging and timbering communal conservation benefits: *Our community benefit from our forests by accessing timber and logs".*

However, he had a different opinion by saying; *the timber and logs are not for sell rather for community development works such as making school desks".*

Moreover, one interviewed young man at one of Ntakata villages, hesitated that they access timber in communal forest, by saying: *"We benefit by accessing building timber and poles from our forests, even though most time we harvest poles for building in non-conserved forests".*

The findings show that communities gain benefits from conservation of their natural resources in different ways. Those benefits likely enhance conservation value which

concurs with Tchakatumba, *et al.*, (2019) conclusion, which showed that when community benefits from conserved resources will value the resource.

4.4.7 Medicinal Trees and Wildlife access in Communal Managed Forests

Impact of medicinal plants and medicinal wildlife access on community economy was high and most valued in Greater Mahale Ecosystem. Medicinal benefits computed mean in communally managed natural resources approach was 4.59 (Table 4.2) which was the strongest mean, 2 points above the average expected mean of 3 (Table 3.3). Medicinal benefit included access and use of different trees and wildlife for cure or prevention of diseases. The higher score in medicinal value showed high dependence on trees, wildlife, and nature by community. The findings were affirmed by interviewed people.

One famous elderly person who lives in remote Greater Mahale Ecosystem village that does not have a dispensary when asked on medicinal communal forests and wildlife benefits, he responded by pointing to the forest, said:

> *"That is our hospital. Our forest is very important to us because we access medicinal plants and use them for cures, healing, and treatments. Even though we are in remote area, and we don't have health infrastructures, we access different medicinal plants in our forests for different diseases treatments such as typhoid".*

The realized medicinal benefit is in line with what Tchakatumba *et al.* (2019) concluded that when local communities are benefiting from natural resources, there is both increase in economic welfare and compliance with natural resource management.

4.5 Objective 2 Results: Communal-Indigenous Non-Consumptive Natural Resources Management impact on Community Economic Benefit

4.5.1 Section Overview

Communal non-consumptive natural resources management impact on community economic benefit findings are discussed and presented in this subchapter. Variables of communal non-consumptive management are presented. Descriptive statistics findings of mean are presented. Findings are presented by Tables, graphs and discussions.

4.5.2 Overall impact of Communal-Indigenous Non-Consumptive Conservation

Among applied natural resources management approaches in villages around Greater Mahale Ecosystem is communal-indigenous non-consumptive. The approach includes tourism photographing, recreation, hotel service, spiritual-ritual and scientific studies and it had impact on community economy. The communal-indigenous natural resources management non-consumptive utilization impact calculated mean shown in Table 4.3 was 46.99. The studied mean was slightly 0.01 points below strong mean of 47 (Table 3.3). This result proposes that communal-indigenous non-consumptive natural resources management produces a weak impact on community economic benefit.

Among challenges that cause weak impact of communal non-consumptive natural resources management on community economic were remoteness and poor road infrastructures (Table 4.3). While grazing, was among strong noted variables that impact community economy (Table 4.3). Key informant interview respondents had same opinions and feelings when asked what are impacts of community non-

extractive benefits of natural resources management. One famous interviewed agropastoral who is also doing traditional healing in one of the villages, said:

> *"We benefit a lot from grazing and accessing pastures for our livestock. We also conduct some worship. However, even though we have good forests and peculiar wildlife such as chimpanzee, we do not receive tourists, maybe because we are remote, and our roads are very bad".*

Table 4.3: Communal-Indigenous Non-Consumptive Conservation Variables

Variable-composites	Mean	Std. Deviation	N
Communal non-consumptive	46.99	11.797	728
Tourism photographing	6.53	2.655	728
Grazing	8.26	2.271	728
Recreation	6.64	1.716	728
Transportation	3.40	1.398	728
Infrastructure's	7.08	1.613	728
Hotel Services	7.02	2.369	728
Spiritual and ritual	4.25	1.810	728
Scientific studies	3.81	1.377	728

Note: N=728

4.5.3 Photographic Tourism and Recreation in Communal Conservation

Photographing and game-viewing tourism in community-managed forests and wildlife areas such as wildlife corridors and wildlife dispersal areas had calculated impact mean of 6.53 (Table 4.3). The calculated mean was just below a strong mean of 7 (Table 3.3). The finding signified a weak composite to explain weak community economic benefit. Analyzed data showed that 68% of respondents strongly disagreed that tourists visit community forests and community wildlife areas (Figure 4.5). Underdeveloped tourist attraction sites were pointed out by some interviewed people as areason that cause few tourists to visit Greater Mahale Ecosystem. One young man who is also doing forest patrol in one of the villages, when asked on community economic benefits gained through tourists' visits community forests and wildlife

areas, he responded and posed a question, said:

> *"Our community have many tourist-attracting sites such as Nkonde waterfalls, however, are less developed, there are neither steps, latrines nor tents at the site" how can tourist come to visit such an area?*

However, the researcher had a physical visit to Nkondwe waterfall and found out that there are few tents at the site but there were no steps, and the road was poorly developed. This result suggests that there are less developed systems that benefit community economy from non-consumptive resources utilization. Less developed systems and capacity are part of weak management capacity. The finding is in line with Muyengwa and Child (2017) who said when and where there is less community management capacity there is less equity and less economic gain.

Whereas recreation impact mean on community economics was 6.64 (Table 4.3) above the strong mean of 5 (Table 3.3). Recreation was connected to looking at beauty of nature which does not cost money. Looking at beauty of nature did not have excludability in utilization and therefore, does not create income. One young woman who was born and lived in highlands of the area when asked on recreational value of nature, said:

> *"Hiiiiii, I do not go to forest for recreation, although we sometimes enjoy looking at our forests and hills. I go to town to enjoy life if I have money. We conduct parties and ceremonies in halls and not in forest".*

The information showed that there was no integrated ecological management that produces integrated conservation economic benefit. Economic welfare is improved when there is integrated conservation of ecosystem and ecological benefit (Andika, 2020). Such integrated management of nature includes enjoying beauty of nature and

ecotourism.

Figure 4.5: Photographic Tourism in Communal-Indigenous Conserved Areas

4.5.4 Grazing and Livestock keeping in Communal conserved Areas

Community around Greater Mahale Ecosystem practice grazing and livestock keeping in communal-managed-forest and wildlife areas such as wildlife-corridors and wildlife-dispersal areas. Grazing and livestock keeping computed impact on community economy mean was 8.26 (Table 4.3) above the strong mean of 7 (Table 3.3). Accessing grazing pastures in communal forests and wildlife areas was important and impactful to the agro-pastoral community.

Even though majority (58%) of respondents agreed to have enough water for their livestock, there was strong concern about access to pastures and markets. It was only 29% of respondents agreed to have enough pasture and only 21.8% of respondents agreed to have a good price for livestock (Figure 4.6). Interviews with community confirmed un-accessibility of pastures in communal forests and wildlife areas. One elderly agropastoral whose grandfather came to Greater Mahale Ecosystem, when asked about livestock keeping and access to pastures, he said:

"Even though our area is remote, we do not access pastures in communal forests. We graze our livestock on our land. However, people from central Tanzania come with their livestock and graze in the forest. Unfortunately, when are caught by forest patrols team, they pay huge fines".

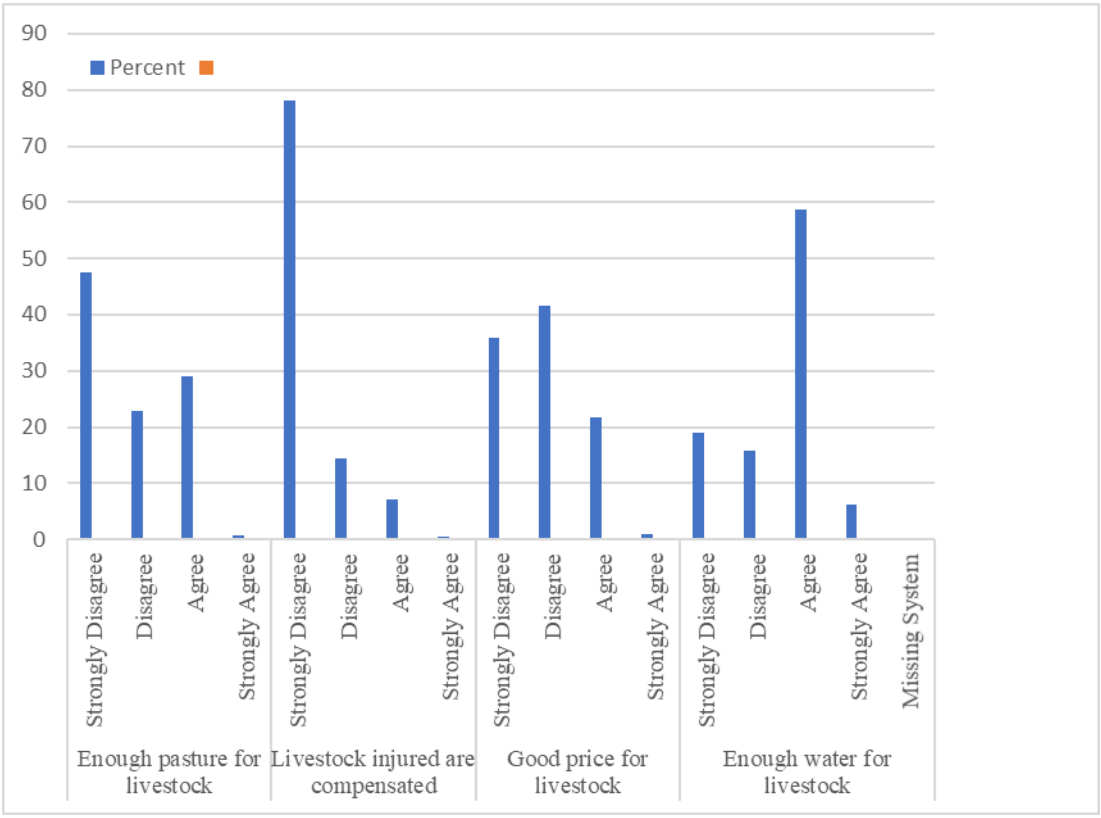

Figure 4.6: Grazing and Livestock keeping in Communal Conserved Areas

4.5.5 Access to Transport and Infrastructure development in Communal conserved Areas

Impact of infrastructure development and access to transport services were studied and found to be less developed in communally managed forest and wildlife areas in Greater Mahale Ecosystem. Impact of transportation services on community economy computed mean was 3.4 (Table 4.3), slightly above the expected mean of 3 (Table 3.3). Even though this mean is above expected, there was strong concern about whether companies pay transport fees and access to vehicles to town. Such

concern implied existence of less community economic benefit. That concern is shown in Figure 4.7 where 90% of respondents disagreed that companies pay transportation fees, and 92% of respondents disagreed to access vehicles to town. Transport access is linked with road infrastructure development.

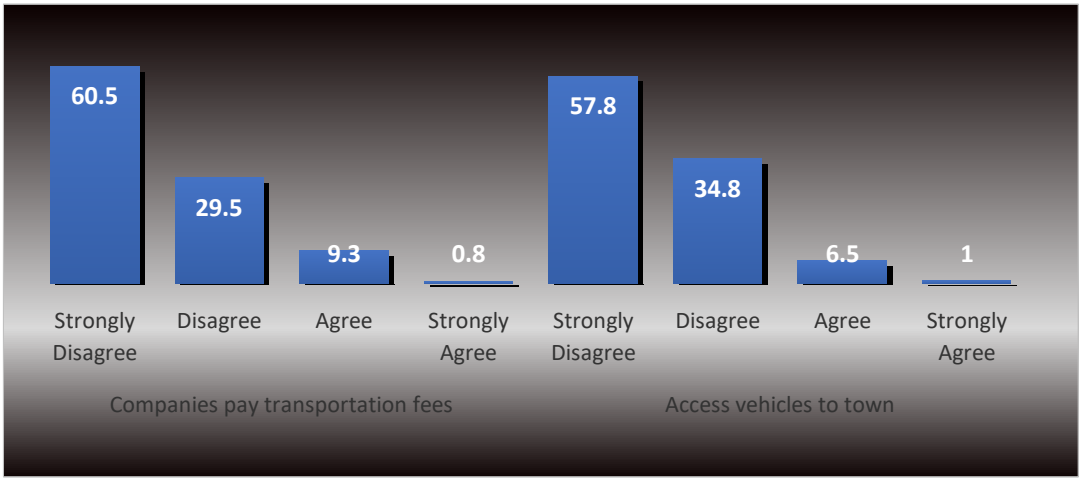

Figure 4.7: Transport Service in Communal-Indigenous Conserved Areas

Infrastructure development that includes road, hotels, schools, and health centers was found to impact community economy. Infrastructure development impact calculated mean was 7.08 (Table 4.3) above the expected average mean of 5 (Table 3.3). Even though the mean looks good and stronger, there was concern that road infrastructures were poor, and that the well-developed infrastructures are health and school structures. Majority (93%) of respondents strongly disagreed on whether there are roads constructions or rehabilitation but also more than 75% of respondents agreed on health facilities and classrooms constructions (Figure 4.8). Not only road infrastructures were noted to be less developed, but also hotel infrastructures as well.

Conservation impact on community economy through hotel service in communal forests and wildlife areas in Greater Mahale Ecosystem was accessed. Impact of

hotel services mean was 7.02 (Table 4.3) which was almost equal to the strong mean of 7 (Table 3.3). The finding suggests almost a strong mean. However, interviewed people had a different opinion on hotel services. One interviewed an elderly woman who has a small vegetable business was interviewed whether they sell products or be employed in communal forests hotels, she said:

> *"I lived here for a long time, but I had never seen a hotel in our village forests, there are no hotels, therefore, I do not sell vegetables to hotels in forest. And how can you be employed in the hotel that is not existing? And who is going to build a hotel when there are no tourists? There is no employment from the hotels because they do not exist".*

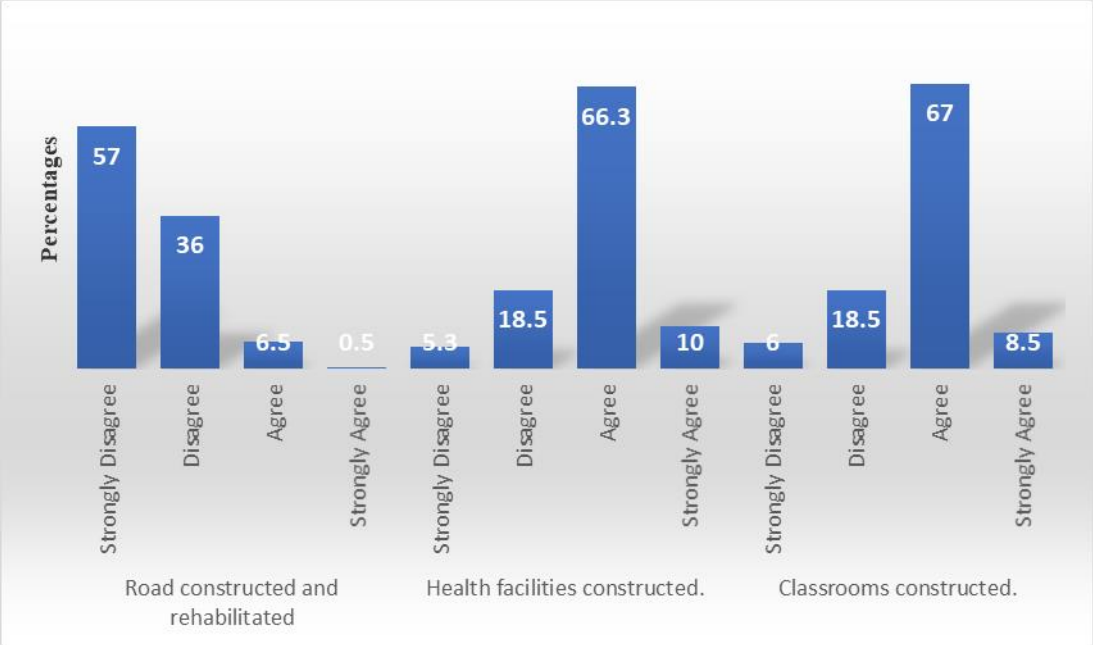

Figure 4.8: Infrastructures in Communal-Indigenous Conserved Areas

4.5.6 Spiritual and Scientific Non-Consumptive Benefits

Impact of spiritual, ritual, academic and scientific gained access to community economic benefits in the Greater Mahale Ecosystem was studied. Spiritual and ritual impacts computed mean was 4.25 (Table 4.3). This was the strongest mean against strong mean of 3 (Table 3.3). The data implies that there were intrinsic conservation values attached to beliefs and taboos. Such intrinsic values were affirmed by

interviewed people. One interviewed respondent who is from a Tongwe tribe and came from Tongwe chiefdom when asked about spiritual and ritual benefit of conservation, said:

> *"There are financial and leadership mysterious powers coming from the forests. There was a big magic snake that provides blessings and leadership powers that lived in our forest near the Kalolwa airstrip. After increased settlement and development the snake moved to Mahale National Park Forest. Elders conduct spiritual and ritual events in that forest, and they receive magical power".*

Whereas impact of scientific and education in community managed natural resources approach mean was 3.81(Table 4.3) against strong mean of 3 (Table 3.3). The scientific benefit is associated with small tokens paid by researchers when they recruit research assistants and data collectors from community. The information was affirmed during interview. One young man who participated as data collector for measuring planted trees' survival rate, when asked about scientific benefits from conservation of communal forests and community wildlife areas, he said:

> *"When you are lucky to be recruited as a data collector, researchers pay some money even though they pay small amounts. Students from Universities visit our forests and wildlife corridors for learning. They recruit us as data collectors and pay us when we assist them in data collection. Even though that is a temporal employment it matters a lot".*

4.6 Objective 3 Results: Communal-Indigenous Control and development impact on Community Economic Benefit

4.6.1 Section Overview

To enable readers, to follow the impact of communal-indigenous natural resources management control and development to economic benefit (CEB), this section is organized into parts. Total descriptive impact is presented by using mean. Presentations of different forms of control are presented by using Tables, graphs and

discusions.

4.6.2 Impact of Communal-Indigenous Natural Resources Management Control

The study researched on impact of communal-indigenous natural resources management control and development to community economic benefit (CEB). Natural resources control and development forms included decision making, laws and bylaws formation, patrols, enforcement of bylaws and laws, and infrastructure development (Table 4.4). A total impact had a mean of33.28 (Table 4.4) that was above astrong mean of 23 (Table 3.3). That outcome indicated that natural resources controls within local communities have impact on community economy. Such impact of control on community economy implies that there is value attached to communal-indigenous natural resources in the study area.

The control strength and value were affirmed by interviewed community member. One famous elderly interviewed person who was born and grew in one village around Greater Mahale Ecosystem when asked about control of natural resources like forests and wildlife, said:

> *"Our people kept this forest and wildlife for years. We developed local bylaws to guide our natural resources. Nowadays we trained our youth in forest game scouting to effectively protect our forests and wildlife resources. We do this because we depend on our forests for many things like medicine and timber".*

The control linked with value communities attach to their natural resources concur with Ostrom (2010) and Tchakatumba *et al* (2019) who said when community benefit from resource they tend to value and conserve them. Furthermore, the attached value result in wise community–natural resources interactions that promises sustainably. However, one district government official in one of Greater Mahale

Ecosystem districts had a different opinion on ability of a community to control their natural resources. When the district natural resource officer, was interviewed on communal control and development of natural resources, said:

> *"Community cannot control natural resources without government intervention because when there is forest intruders, villages request district government to expel intruders".*

The reservation from the government officer concurs with other conservation scholars on weak ability of community to attain sustainable interaction with natural resources as was argued by Cavendish & Campbell (2005), Child & Barnes (2010), Galvin (2018) and Oduor (2020).

Table 4.4: Communal-Indigenous Control and Development Variables

Control and development variables	Mean	Std. Deviation	N
Communal control and development	33.28	4.765	730
Decision making	5.12	1.248	730
Laws and bylaws formation	9.23	1.584	730
Patrols	9.25	1.564	730
Enforcement of bylaws and laws	5.62	1.130	730
Infrastructure development	4.07	1.452	730

Note: N=730
Source: Research Data, (2022)

4.6.3 Decision-making in Communal Natural Resources Management

Impact of decision making in community natural resources management approach on community economy computed mean of 5.12 (Table 4.4) found against strong mean of 3 (Table 3.3). This is a significant strong mean. Strength of those composites was found in decisions to use money. Majority of respondents (86.8%) agreed that they make decisions on how to use gained money (Figure 4.9). However, respondents showed that they do not make decisions on using natural resources. It was less than

half of the respondents (46.1%) agreed that they make decisions on how to use their resources (Figure4.9). This means communities feel less empowered to use their resources. The information was confirmed by interviewed people. One famous elder who lives in one village around Greater Mahale Ecosystem and was an influential political person, when interviewed on control and decision-making on natural resources, he said:

> *"We lived with these forests and wildlife for years, you see them greener and attractive in the country, we feel that we are better capable to decide how to use them than anyone else. We have our ways of financial management and accountability. Unfortunately, most decisions of natural resource management are top-down that come witha less participatory approach, they are just imposed by the governmenton us".*

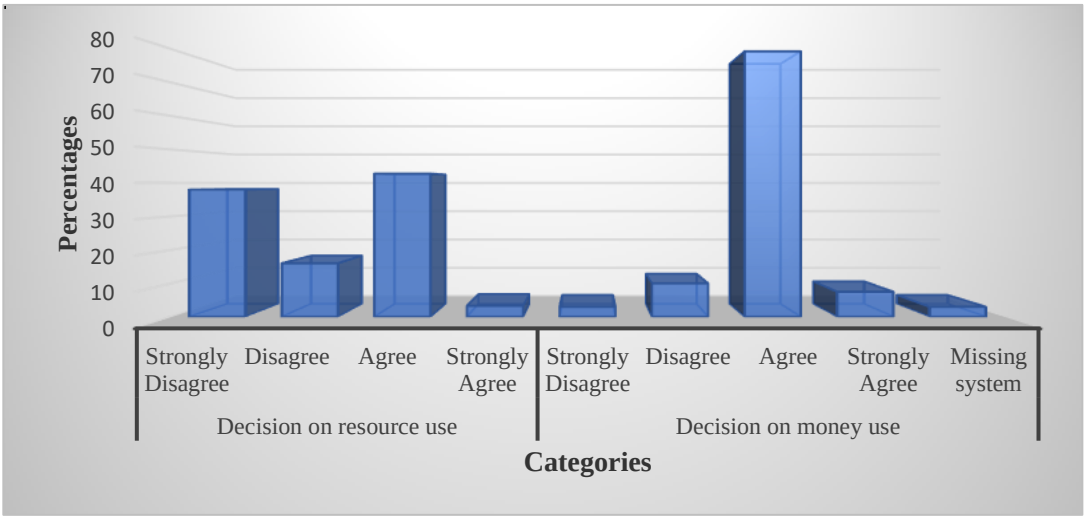

Figure 4.9: Decision making in Communal-Indigenous Conservation

Source: Research Data, 2022

The finding shows that there are levels of government controls even in communal natural resources conserved areas. The finding shows that even when there is government involvement in controls, community economic benefit can increase. This finding challenges the conclusion by Bluwstein*et al.* (2016), Moyo *et al*. (2017) and Keane *et al.* (2020) on conflicts, access, and resources conservation, who argued

that centralization of natural resources management and control, decrease land accessibility, hence decrease community economic welfare.

4.6.4 Law Formation and Patrols in Communal Natural Resources

Impact of bylaws and regulations formation in community natural resources management approach on community economy was found to be strong with a mean of 9.23 (Table 4.4). The calculated mean was almost twice the strong mean of 5 (Table 3.3). The strength in communal bylaws was seen in majority of respondents agreeing that there are regulations formations (91.8%) (Figure 4.10) and almost all (94.6%) agreed that there are fines for culprits (Figure 4.10). Not only that the communities form bylaws, but also conduct patrols. High calculated mean realized in patrols and controls at 9.25 (Table 4.4) against almost double strong mean of 5 (Table 3.3).

The high mean implied high impact and good performance of communal natural resources control and development. There was high score in all parameters of patrol as seen in Figure 4.10. Regular and ambush patrol (95.1%), presence of patrol schedule (94.1%), and paid patrol team (93.8%) as seen in Figure 4.10. These high numbers of percentages show high level of community participation in patrols. The information was affirmed by interviewed people. One popular and influential elder living in upper villages around Greater Mahale Ecosystem when asked about communal control of natural resources, he said:

> *"We have our community unions such as Tongwe Trust at Buhingu division and JUMIMITA at Ntakata forest scheme. We conduct patrols with our youth. Nowadays there is payment to all people who go for patrol in Ntakata forest. Even though in past years there were no payments, we always conducted patrols voluntarily".*

The result implied that community can organize themselves to manage and control their resources. The finding is in line with Common Pool Resource Theory that support communal conservation approaches. The argument on shortfall of the Theory on weak communal approach and risk of trial and error in building efficient local institution in a way of "self-organizing" is proved not to matter (Saunders, 2014). The weakness of communal control of natural resources that is stated in Common Pool Resources (CPR) Theory discussed by Kerapeletswe & Lovett (2005) and Morrison *et al.* (2016) is challenged. This calls for further studies in the Theory and on communal controls.

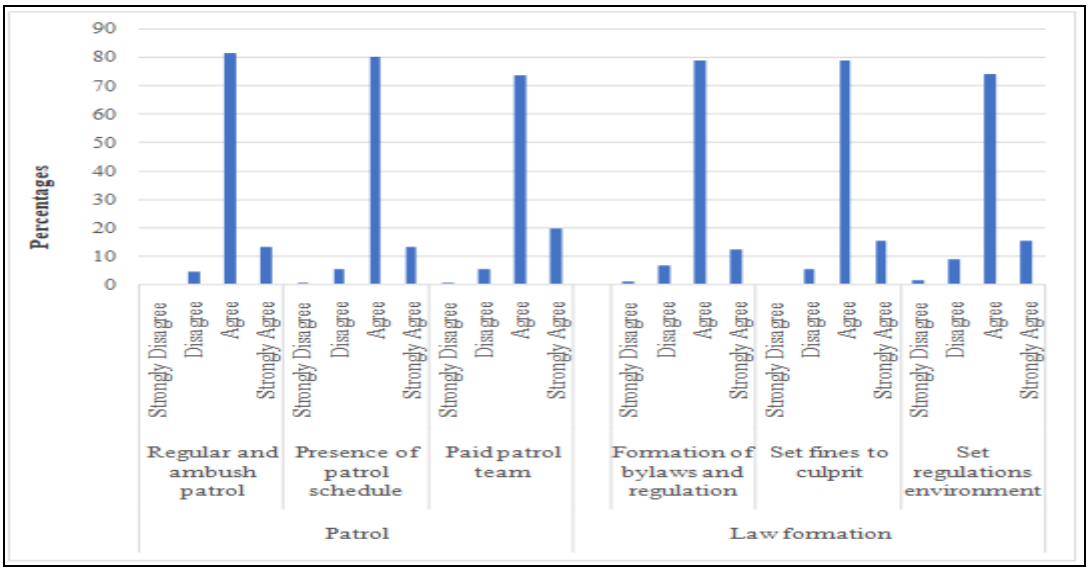

Figure 4.10: Law Formation and Patrol in Communal-Indigenous Conservation

4.6.5 Enforcement and Infrastructure Development

Impact of communal enforcement and enactment of bylaws in community natural resources management approach to community economy computed mean was 5.52 (Table 4.4). The calculated mean was slightly above the strong mean of 5 (Table 3.3). Strength in communal enforcement was associated withpaying fines without favoritism (91.1%) as seen in Figure 4.11. However, 39% of respondents had

disagreement on enforcement that fines were deposited in banks (Figure 4.11). This data indicates questionable financial transparency and may also indicate that the gained money may benefit few advantaged ones.

This result is in line with Child & Barnes (2010) and Galvin *et al.* (2018) who studied community based natural resources management (CBNRM) effectiveness in Southern African countries (Zimbabwe, Botswana, Namibia and Zambia). Their studies revealed almost same result that most community based natural resources management governance are weak and do not practice equity. Child & Barnes (2010) and Galvin *et al.* (2018) stated that most CBNRM have favoritism and there is no fairness in resources utilization. The above-mentioned findings show that there is no favoritism, although the findings also showed that there is no transparency in fund utilization. To enforce bylaws and conduct sound patrol, infrastructures should be developed.

Infrastructure development in community natural resources management impact on community economy calculated mean was 4.07 (Table 4.4). The calculated mean was weak mean below strong mean of 5 (Table 3.3). The weak mean was associated with fewer interventions on structural development. Majority of respondents (70.8%) disagreed that there were plans to develop infrastructures and majority of respondents (80%) disagreed that developed infrastructures benefitted livelihoods (Figure 4.11). The result implied existence of poor infrastructures. Such poor infrastructures included poor roads that were passable during dry season only. Inaccessible roads and absence of guard posts hindered quality patrols in natural resources management.

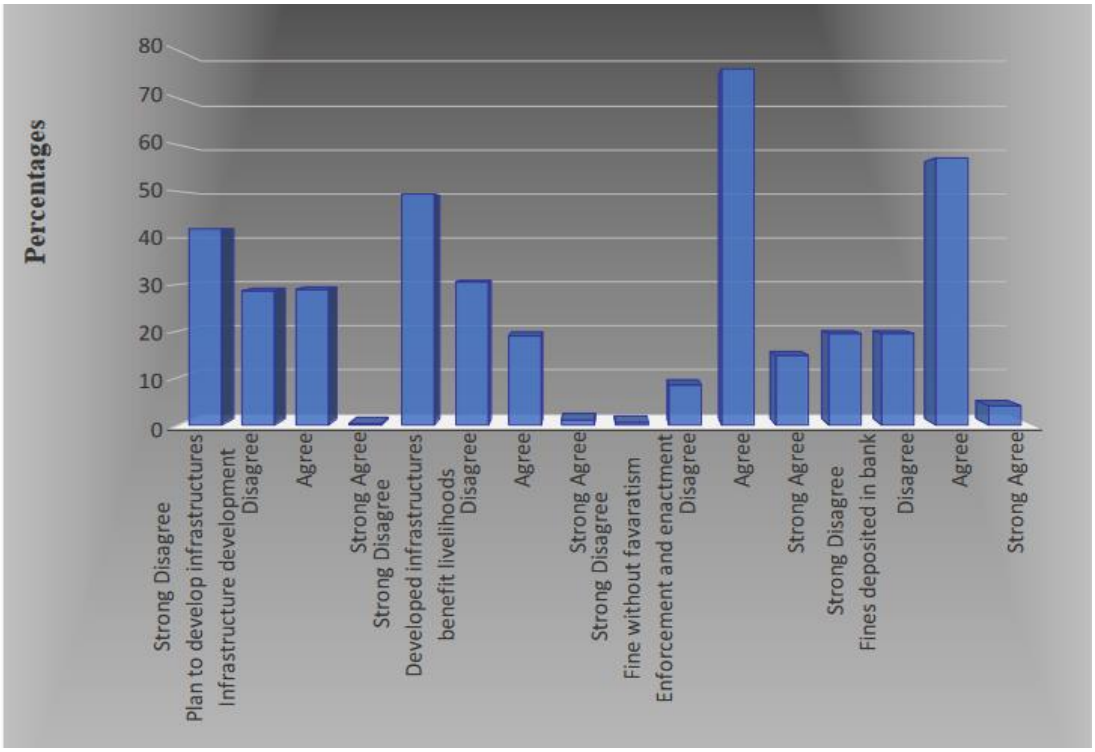

Figure 4.11: Enforcement and Infrastructure Development

4.7 Objective 4 Results: Impact of Government-State Consumptive Terrestrial Natural Resources Management Approach on Community Economic Benefit

4.7.1 Section Overview

This subchapter presents and discusses findings of government-state consumptive natural resources management impact on community economic benefit. The subchapter used Tables, graphs and discussion to present data and makes the reader follow through. Central tendency mean and frequency charts have been used to show impact and relationship.

4.7.2 Overall Government-State Consumptive Conservation impact on Community Economic Benefit

Impact of government-statenatural resources management approach to community economy in Greater Mahale Ecosystem studied. Government consumptive utilization

approach of forests and wildlife resources included hunting tourism, access to timber, firewood, wild game, wild fruits, and medicinal trees and wildlife. Studied impact mean of 32.31 (Table 4.5) slightly below strong mean of 33 (Table 3.3) was produced. The finding suggests that there is weak impact on community economic benefit from government-state consumptive natural resources management in the area. Poor road infrastructure was mentioned as contributing factor that causes weak economic benefits. Interviewed community members testified to the findings.

One prominent old man who is a retired government officer when interviewed on his opinion on impact of consumptive government-state conservation on economic benefit, said:

> *"There are numbers of economic benefits from government-state consumptive natural resources utilization in our area. We built a primary school, because we received money from Nkamba forest hunting block, and Karema health center is constructed withmoney gained out of selling confiscated timber from Tongwe West Forest reserves. Conservation of government forests and wildlife is paying us"*

However, there was a slightly different opinion from other respondents who felt the benefit they gain is comparatively less due to the remoteness of the area. One elder living in the lower village around Greater Mahale Ecosystem, when asked about consumptive conservation economic benefit from government forest and wildlife conservation, he said:

> *"Even though we have hunting blocks such as Nkamba forest hunting block, we receive very few hunting tourists may be due to remoteness, and due to our roads been poorly developed. Even when we harvest timber and logs from our forests, always there are few buyers. We do not make good money because of those issues."*

The findings and community interview opinions on gaining less community economic benefit from government-conserved area is different from the findings and

conclusion by Andam *et al.* (2010). Andam *et al.* (2010) studied modern natural resources management through "existence of protected areas" which is under government management. The result is also different from review report on global dynamics of protected areas conducted by Lewis *et al.* (2017).

Table 4.5: Government-State Consumptive Conservation Variables

Variables-composites	Mean	Std. Deviation	N
Government-state consumptive	32.31	12.317	722
Hunting tourism	3.47	1.639	722
Farming	8.79	2.536	722
Meat and Fruits	4.90	2.399	722
Firewood	5.28	2.744	722
Medicinal	4.53	2.044	722
Logging and timbering	5.33	2.583	722

Note: N=722

Furthermore, the result is also different from the studied impact of wildlife management areas (WMAs) to the community by Keane *et al.* (2020). All the mentioned studies concluded that the more protected areas the bigger the revenue and improvement in community economy welfare around the protected areas. Remoteness and less developed roads in Greater Mahale Ecosystem may be among the contributing reasons for government-conserved areas to produce less economic benefit than expected.

4.7.3 Hunting Tourism and farming around Government conserved Areas

Impact of hunting tourism in government-state managed forests and wildlife hunting blocks on community economic benefit was tested. Calculated impact mean for hunting tourism in government-state consumptive natural resources management approach was 3.47 (Table 4.5). The derived mean was slightly above strong mean of 3 (Table 3.3) by 0.47 points. The finding suggests that gained economic benefit from

hunting tourism in government-managed forests and wildlife areas such as hunting blocks were not very strong. Moreover, majority (68.5%) of respondents strongly disagreed that hunting blocks in government natural resources managed areas are active and whether hunting quotas and permits are issued (Figure 4.12). Hunting tourism which harvests wildlife, was studied concomitantly with crop farming in government managed forests and wildlife areas.

Farming near government-state conserved natural resources such as forest reserves, wildlife hunting blocks and national parks conservation impact on community economy was studied. Sub variables such as compensation for destructive wildlife were also studied. The farming impact computed mean was 8.79 (Table 4.5). The computed mean was significantly 1.79 points above strong mean of 7 (Table 3.3). The data suggested a strong impact on community economy from farming around government-protected areas. Response on a detailed assessment of farming near government conserved areas showed that 26.6% agreed that farms produce more harvest near government conserved areas (Figure 4.12). That was a bit surprising as it was expected that farming near protected government-state areas will produce less. The information was affirmed by interviewed people. One famous agropastoral in lower villages around Greater Mahale Ecosystem, when asked about farming economic benefit of government-state conserved area, he responded by saying:

> *"All of us would love to have a farm near Nkamba forest. Near Nkamba forest reserve, there are strong controls, more fertile land, and there is less fire occurrence".*

He added by saying

> *"that is why many of us would prefer to have a farm near that land. Even though it is a long-distance walk from our villages, if you get a farm in that area, you are sure of bump harvest".*

However, there was mixed feeling and response to compensation for destructive wildlife. The same person (Key Interview person) had a reservation that, the main challenge of farming in such area is destructive wildlife such as baboons, as he said:

> *"The main issue on farming near that forest is the struggle to protect crops from destruction of baboons and vervet monkeys".*

Moreover, there was a small, reported level of compensation for destructive wildlife on crops. Some households' respondents (14.1%) agreed that are compensated when crops are destroyedby wildlife (Figure 4.12). The finding is aligned with some Key interview respondents. One popular farmer in lower village around Greater Mahale Ecosystem who lived in the area for more than 20 years ago, when asked whether farmers' crops are compensated when destroyed by wildlife, he said:

> *"Sometimes, we are compensated when our farm crops are destroyed by wildlife especially when the wildlife comes from National Park. For example, when hippo destroyed rice near Kasekese, we were paid".* He also said *"Even though it is not every time we are compensated, for example, sometimes, chimpanzees enter ourfarms and take few sugar canes, no one compensates for that. Chimpanzees are not destructive wildlife compared to baboons".*

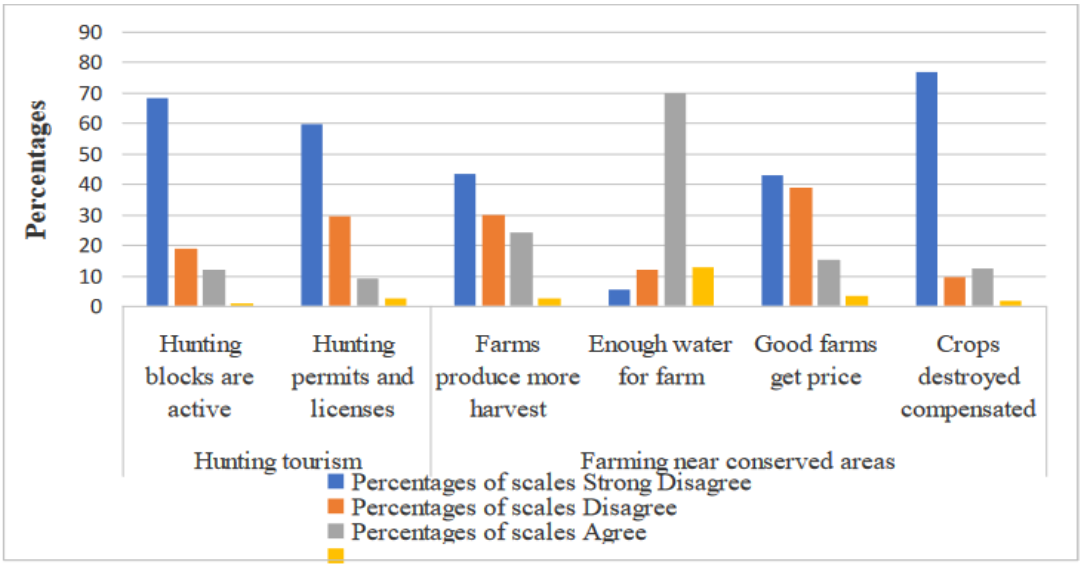

Figure 4.12: Hunting Tourism and Farming in Government-Sate Conserved Areas

4.7.4 Access of Wild Game – Fruits and Firewood in Government Conserved Areas

Conservation impact on community economy from wild game, fruits, and firewood access in government conserved areas such as forests reserves, game-controlled areas and wildlife hunting blocks were studied. Impact of meat and fruits for use in government-state-managed natural resources mean was 4.9 (Table 4.5) just below strong mean of 5 (Table 3.3). This was a weak mean suggesting either less community dependence on forests for fruits and wild game or inaccessibility to fruits and wild game in government conserved forests. Detailed assessment showed that few (12.1%) respondents agreed on availability of enough bush meat (Figure 4.13). The data suggest that wild game and fruits are not much accessed in government conserved areas. The accessibility of fuel-firewood was also studied.

Figure 4.13: Meat – Fruit and Firewood access in Government-Consumptive Model

Conservation impact of firewood and energy access in government-state managed natural resources mean was 5.28 (Table 4.5) just above strong mean of 5 (Table 3.3). Even though it was a strong mean, the difference was small. Detailed assessment

showed that majority (70%) of respondents disagreed that they access firewood, wood for charcoal and wood for sale in government-conserved forests and wildlife-controlled areas (Figure 4.13). One interviewed aged woman who lives in the upper villages around Greater Mahale Ecosystem, when asked about access to firewood, said:

> *"We collect firewood from our farms and from non-conserved forests that are general lands. Often, we do not collect firewood from government conserved forests".*

4.7.5 Medicinal Values and Timber Access in Government managed Forests and Wildlife Management Areas

Conservation impact on community economy through access to medicinal plants, medicinal wildlife, timber, and logging found to be a most valued benefit in Greater Mahale Ecosystem. Medicinal benefits impact in government conserved forests and wildlife management areasmean was 4.53 (Table 4.5). The mean was significantly stronger for 1.5 points above strong mean of 3 (Table 3.3). Almost one-third (30%) of respondents strongly agreed to access medicinal plants for cure and treatment (Figure 4.14). This is a substantial number to suggest that communities depend on government forests and wildness for wildlife management areas to access traditional medicines. The information coincides with interviewed people.

One famous elderly person who lives in remote Greater Mahale Ecosystem village that does not have a dispensary was asked on government forests and wildlife-controlled areas medicinal economic benefits and this is what he said:

> *"Not only village forests, but also government forests are very important to us for accessing medicinal plants. You know, you cannot find all types of needed medicinal trees in one forest. Some of*

them are in our farms, others in village forests, others in riparian forests and others are in government forests. We go to all forests to get medicine"

Access to medicinal plants and medicinal wildlife seemed to be of great value to remote community of Greater Mahale Ecosystem. Such attached community benefits will likely contribute to conservation compliance (Tchakatumba *et al.*, 2019). Trees were not only accessed for medicine but also were accessed for timber and logging purpose.

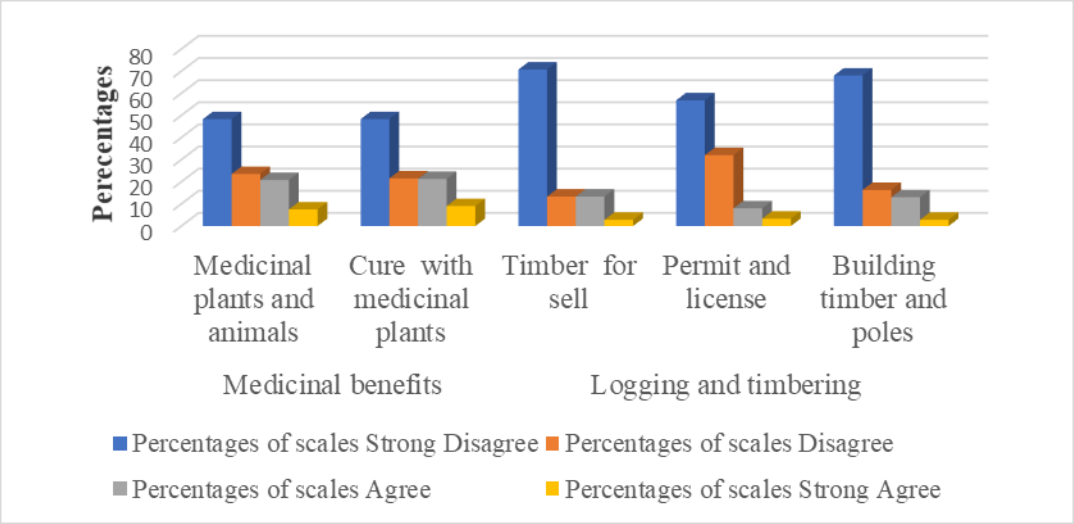

Figure 4.14: Medicine and Timber access in Government Conserved Areas

Conservation impact on community economy through access to logging and timbering mean was 5.33 (Table 4.5) just 0.33 points above strong mean of 5 (Table 3.3). Although it was expected that community would have a stronger conservation impact on community economy, from timbering and logging permit, it was not the case in this study. Majority (88.8%) of respondents strongly disagreed to access timbers and logs from government conserved forests (Figure 4.14). The finding implied that timber harvesting benefit is minimal to the studied community. Poor infrastructures such as poor road networks were associated with poor timber business

even in government-state conserved forests.

Moreover, some community members had concerns about how the little money they gain from timber business is utilized. One interviewed young man who is also a member of village natural resource committee in village around Greater Mahale Ecosystem when asked about government forest timber and logging benefits, said:

> *"Timber harvested from the government forests by issuing harvest permits, however, I do not know if we get any share of that money and what those money is used for. I just recall one-time logs confiscated and sold at 600 million shillings and the money used to construct Karema health facility".*

The information suggested that there is less transparency in financial matters and less financial accountability. The finding coincides with Child & Barnes (2010) and Galvin *et al.* (2018) who studied community-based conservation (CBNRM) and found some questionable financial management in CBNRM. The finding shows that questionable financial management is not only in communal natural resources management but also in government-managed natural resources.

4.8 Objective 5 Results: Impact of Government-State Non-Consumptive Terrestrial Natural Resources Management Approach on Community Economic Benefit

4.8.1 Section Overview

This subchapter presents and discusses findings of government-state non-consumptive natural resources management impact on community economic benefit. Descriptive data using mean as a central tendency and frequency graphs are used to discuss the findings. Data and findings are presented in Tables, graphs and discussions to easier reader comprehend the information provided.

4.8.2 Overall impact of Government-State Non-Consumptive conservation on Community Economy

Government-state non-consumptive natural resources management is among conservation approaches applied in villages around Greater Mahale Ecosystem. Government-state non-consumptive utilization of natural resources that includes tourism photographing, recreation, hotel service, spiritual-ritual and scientific studies have impact on community economy. An impact calculated mean of 50.08 (Table 4.6) for government-state natural resources management non-consumptive utilization approach was realized. The study mean was higher by 3 points from strong mean of 47 (Table 3.3).

The finding connotates that there is strong impact between government-state natural resources management non-consumptive utilization on community economic benefit. Such results suggest that although Greater Mahale Ecosystem is a remote area, it receives significant benefits from government conservation non-consumptive resource utilization such as tourism and scientific studies. Government-state non-consumptive utilization included hotel-related services in national parks and tourist visits. The gained economic benefits affirmed by interviewed people. One elderly person who lives in a village near Mahale Mountain National Park, had this to say when asked about non-consumptive natural resources management economic benefit in government-state conserved areas like a national park, he said:

> *"Youth from our community get money by guiding tourists for chimp trekking in the National Park. The National Park employees come to spend in our shops and bars. And sometimes tourist hotels come to purchase some supplies in our villages".*

However, there was a different concern opinion from other respondents who thought that government-state conserved areas are not doing well financially. One interviewed youth in a village around Greater Mahale Ecosystem who is doing tourist chimp trekking, when asked about economic benefit of national park conservation, he said:

> *"Although we make some money from supporting tourist's chimpanzee hiking, I wonder why our National Park receives relatively few tourists while we have unique attractive biodiversity such as many chimpanzees and colorful fish in the lake".*

The result and opinions on impact of government-state conserved areas such as national parks on economic benefit were in line with Andam, *et al.,* (2010) who studied modern natural resources management through "existence of protected areas". It is also concurring with report on global dynamics for protected areas conducted by Lewis, *et al.,* (2017). Furthermore, it aligns with studied impact of wildlife management areas to community by Keane, *et al.,* (2020). All the studies concluded that the more the protected areas the bigger the revenue and improvement in community economy welfare around protected area.

Table 4.6: Government-State Non-Consumptive Conservation Variables

Variable -composites	Mean	Std. Deviation	N
Government-state non - consumptive	50.08	18.054	716
Tourism photographing	7.34	3.400	716
Grazing	8.28	3.076	716
Recreation	6.86	2.036	716
Transportation	3.83	1.768	716
Infrastructure's	6.90	2.427	716
Hotel services	8.38	3.557	716
Spiritual and ritual	4.31	1.879	716
Scientific studies	4.17	1.772	716

Note: N=716

4.8.3 Photographic Tourism and Recreation in Government Conserved Areas

Impact of photographing and game viewing tourism in government-state managed forests and wildlife areas such as national parks and forests reserves on community economy mean was 7.34 (Table 4.6). The calculated impact mean was just above the strong mean of 7 (Table 3.3). Although it is a strong mean, it is not a high mean in government-conserved natural resources such as National Parks. The government conserved natural resources experienced less photographic opportunity which was associated with few tourists visiting the area as it was seen in Figure 4.15. Few respondents (15%) agreed that tourists visit their government conserved areas (Figure 4.15).

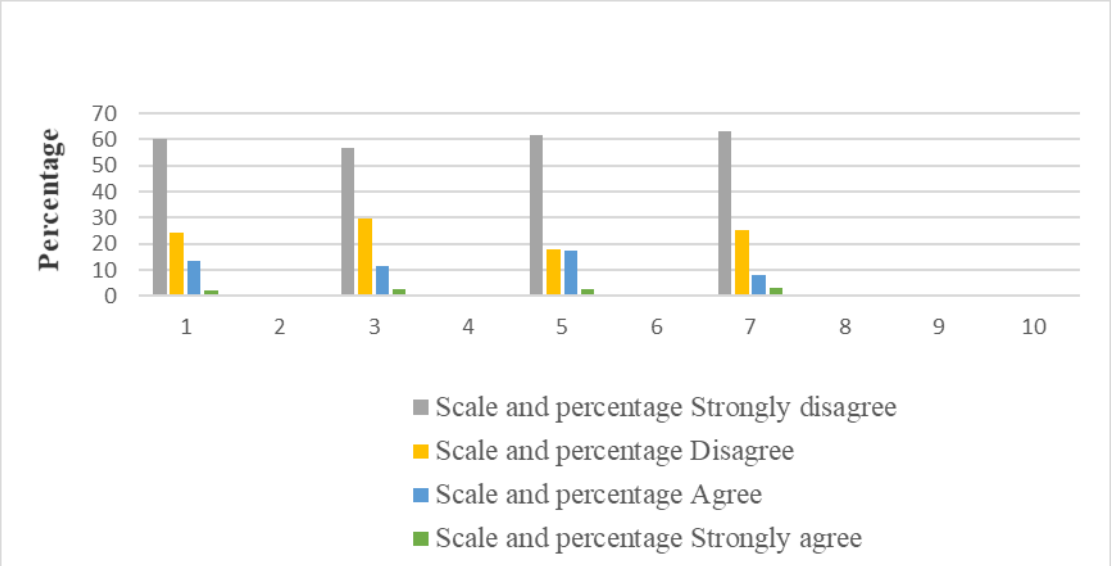

Figure 4.15: Photographic Tourism in Government-State Conserved Areas

The data suggests poor gained community economic benefits from photographic tourism in government-state conserved areas. Whereas recreation's impact on community economic benefit was strong in government-state managed natural resources. Impact of recreation in government-state managed natural resources computed mean was 6.86 (Table 4.6) which was almost 2 points above the expected

mean of 5 (Table 3.3). However, recreation was linked to looking at beauty of land which one could enjoy without paying money. That challenge of accessing resources without paying money is caused by absence of excludability in utilization of natural resources.

4.8.4 Grazing and Livestock keeping around Government Conserved Areas

Impact of grazing and livestock keeping around or close to government-managed forests and National Parks on community economy around Greater Mahale Ecosystem was high. Grazing and livestock keeping in government-state managed natural resources mean was 8.28 (Table 4.6) against strong mean of 7 (Table 3.3). Although this was a strong mean, only 22.8% (Figure 4.16) of respondents agreed to have enough pasture. The information was affirmed by interviewed respondents who showed concern that although there are good pastures in government-conserved forests; they are not allowed to graze their livestock in those forests.

One interviewed livestock keeper, who lived in one village around Greater Mahale Ecosystem for a long time moving from central Tanzania, was asked about benefits of government forests and National Parks for livestock keeping, said:

> *"Those forests are very good places for grazing cattle. But we graze our cattle on our land and strictly we are not allowed to graze in those conserved forests. Once your cattle are caught in the forest, you pay huge fines, or cattle are confiscated".*

This finding disclosed that there is insufficiently integrated livestock-keeping development and plans like ranches in most areas. Moreover, a detailed analysis (Figure 4.16) showed very few respondents (11.8%) agreed on livestock

compensation when injured by wildlife. That data suggested less community economy benefit accrued from livestock keeping and grazing around government protected natural resources.

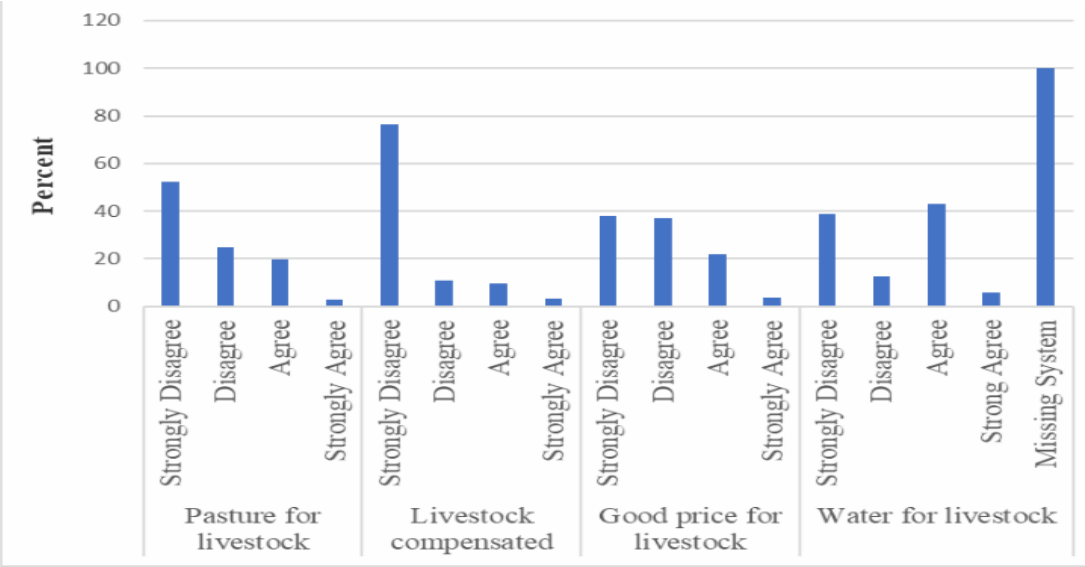

Figure 4.16: Livestock and Grazing in Government-State Conserved Areas

4.8.5 Access to Transport and Infrastructures development in Government conserved Areas

Impact of infrastructure development such as roads, hotels, and access to transport services to community economy under government-state managed natural resources in Greater Mahale Ecosystem was strong. Such studied government conserved resources included forest reserves and National Parks. Impact of transportation services on community economy mean was 3.8 (Table 4.6) slightly above strong mean (Table 3.3) by 0.8 points.

Although transportation impact mean to community economy was high, there were concerns, where majority (86%) of respondents disagreed that companies pay transportation fees, and they access vehicles to town (Figure 4.17). Greater Mahale

Ecosystem is experiencing opening of road infrastructures. Road networks increase transportation services as well. Recently there are constructed roads such as Kigoma to Kalya road, Mwese to Mpanda road and Mwese to Rukoma road that make a sort of small Western Greater Mahale Ecosystem tourist circuit. The constructed roads increase movement and human unplanned settlement mainly along the roads. The result is in line with TAWIRI (2018) report and William (2018) who said, the Greater Mahale ecosystem that was remote with poor accessibility is opening with constructed roads. Besides roads, there are other constructed infrastructures such as hotels.

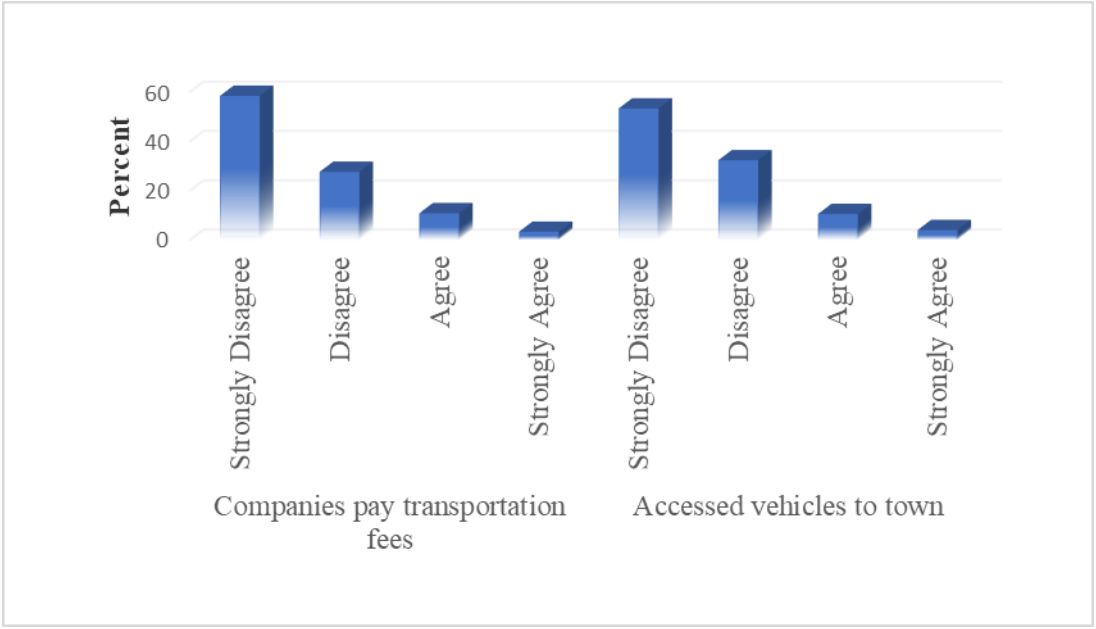

Figure 4.17: Transport Service in Government-State Conservation Areas

Impact of infrastructure development on community economy computed mean was 6.9 (Table 4.6) against strong mean of 5 (Table 3.3). The finding suggests higher infrastructures impact on community economy in the area. However, respondents showed that they had good classrooms and health infrastructures facilities constructed and not roads. Classrooms and health facilities construction ranked

48.3% and 47.1% respectively in detailed analysis (Figure 4.18). Moreover, there was concern that roads are not all-weather functioning, meaning that roads are passable during dry season only. Majority (84.6%) of respondents in Figure 4.18, disagreed that they have good roads or roads are rehabilitated. The finding suggests that the roads are just seasonal roads.

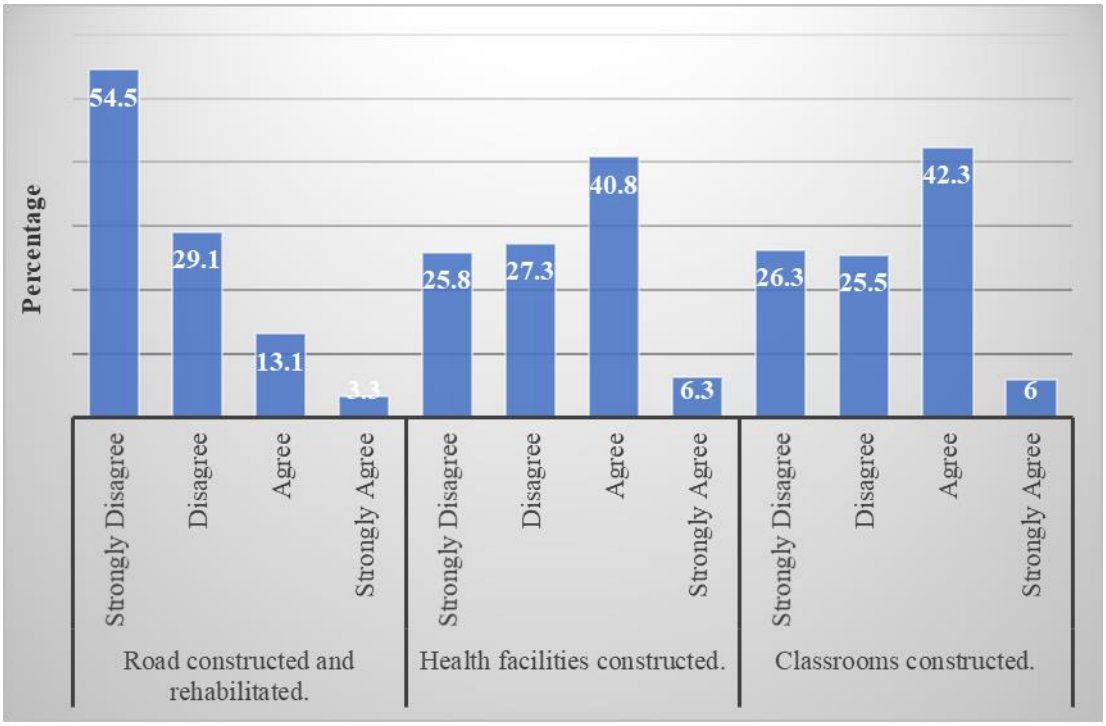

Figure 4.18: Infrastructure Development in Government- State Conservation

Impact of hotel services on community economy in government conserved natural resources calculated mean was 8.38 (Table 4.6) which was one point higher than strong mean of 7 (Table 3.3). Presence of hotel service suggests good ability to host tourists and visitors. However, there were concerns about hotel service impact on community economics raised by key informant interviews. One of the interviewed elderly women who moved to Greater Mahale Ecosystem village with her husband soon after Tanzania's independence, had some concerns when asked on performance

of tourist hotels in their economy, she said:

> *"There are good hotels in national parks such as Mbalimbali and Greystock in MahaleNational Park. Tourists and visitors stay in those hotels. When it is a high season (meaning the season with many tourists), youth and some women get jobs in the hotels. However, only few tourists visit our village. But also, few tourists visit our National Park and I do not know why many tourists do not visit our National Park, maybe the reason is we are in a remote area with poor roads. Even few tourists who visit this National Park, remain in luxurious hotels in National Parks, they do not visit our villages".*

4.8.6 Spiritual and Scientific Benefits in Government-conserved Areas

Impact of spiritual, ritual, academic and scientific government natural resources conservation on community economy in villages around Greater Mahale Ecosystem were studied. Impact of spiritual and ritual benefits mean was 4.31 (Table 4.6) against strong mean of 3 (Table 3.3). The finding suggested that there is community economic impact from spiritual conservation in the geography. Significant number of respondents (30% and 25%) agreed that people worship in the wilderness (Appendix VI) and that there are magical powers coming from the forest respectively (Figure 4.19).

The spiritual value of wilderness conservation was also affirmed by interviewed people. One Pimbwe tribe interviewed elderly person who lived near Katavi National Park for a long time, when asked about spiritual importance of government forest and wildlife conservation, said:

> *"There is a lot I can talk about our wilderness and ancestral powers". "We had our ancestor called Katabi, who made the Katavi National Park to be named Katavi". Katabi had a wife called Wamwera. Both Katabi and Wamwera are still living in Katavi National Park and sometimes they travel out of the National Park. If you are lucky, you can meet or see them. Katabi and Wamwera help*

people when they are in trouble. For example, when people had breakdown, Katabi or Wamwera can appear and provide sugarcane or even bread and then they disappear. You should know that Katabi or Wamwera can give you different powers such as richness or leadership powers. Clever big leaders are having their worshiping sites in the forest where Katabi and Wamwera become happy and bless them."

Such intrinsic deep-seated beliefs make the community value and conserve their forests and wilderness.

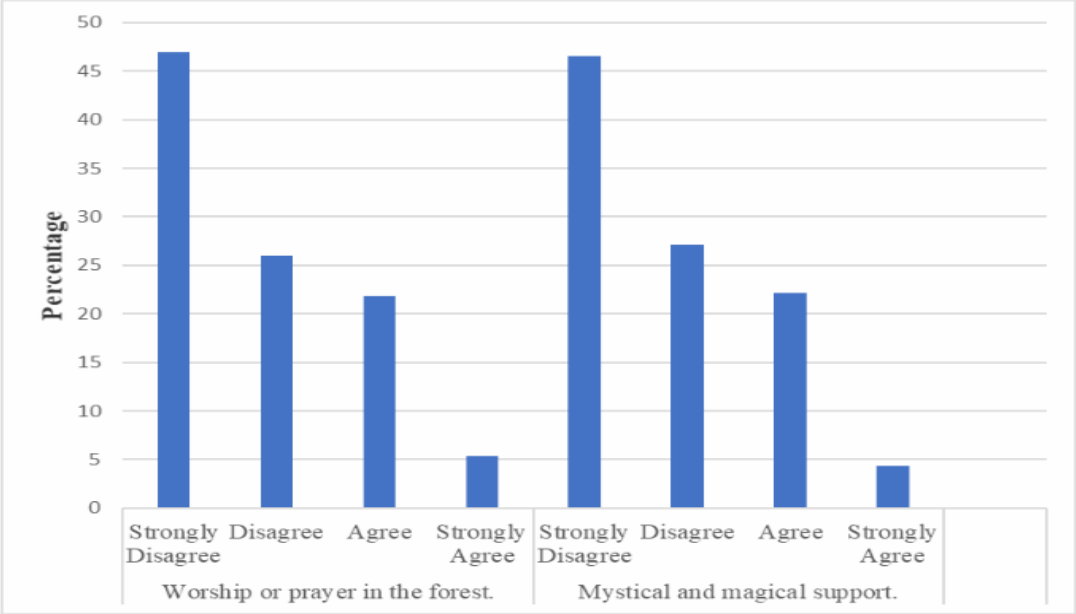

Figure 4.19: Spiritual and Ritual Benefits in Government-State Conserved Areas

Impact of scientific and education government-state managed natural resources on community economy computed mean was 4.17 (Table 4.6) higher by one point against strong mean of 3 (Table 3.3). The result suggested that there was strong educational impact on community economy in the area. The information affirmed by interviewed respondents who showed that researchers visit their forest. One interviewed young man who escorts chimp trekking tourists in Mahale Mountain National Park, when asked about scientific wildlife conservation in national park, its

impact on community economy, said:

> *"We receive researchers in our forests. There are varieties of wildlife and birds in this forest. Our Mahale Mountains National Park Forest is the place where the longest and still ongoing research on chimpanzees is continuing and Gombe National Park. We are paid when we support researchers and when we escort chimpanzee trekking tourists".*

This information is in line with TAWIRI (2018) report that recognizes importance of Greater Mahale Ecosystem for having longest and ongoing studied primate - chimpanzee. The unique biodiversity and scientific reasons suggested special attention is attached to the geography of Greater Mahale Ecosystem.

4.9 Objective 6 Results: Control and Development in Government-State Terrestrial Natural Resources Management Approach impact on Community Economic Benefit

4.9.1 Section Overview

To enable easy grasp impact of government-state natural resources management control and development to economic benefit (CEB), this section is organized into parts. Sections are presented by using Tables and graphs. Findings are discussed mainly by using central tendency of mean.

4.9.2 Overall Impact of Government-State Control and development Conservation on Community Economy

The study researched impact of government-state natural resources management control and development approaches on community economic benefit (CEB). Impact of natural resources control included five composites of decision making, laws and

bylaws formation, patrols, enforcement of bylaws and laws, and infrastructure development (Table 4.7). To grasp its impact on community economy, total mean and composite mean were computed. The study realized government-state natural resources management control and development impact mean of 33.02 (Table 4.7).

The computed mean was higher than strong mean of 23 as per Table 3.3. That outcome indicated that there was strong impact of government-state natural resources controls and development on community economic benefit in the study area. The high mean associated with value attached to natural resources by community regardless of the control approach. Interviewed key informants confirmed the way they value nature.

One elderly famous man, who lived in the village around Greater Mahale Ecosystem for a long time, when asked about controls of government-state forests and wildlife economic benefit, said:

> *"These forests and wildlife belong to us. We kept them for along time. We did not have boundaries. We are the ones who know how to work in harmony with poisonous snakes like black mamba. There are special leaves when we have them in our pockets, black mamba just sleeps. We know how to go intoa forest safely. Even though government came in and showed some boundary of management, the forests still belong to us."*

That result and comments suggested existence of sense of natural resources ownership in community and community value natural resources, which is an important factor for collaborative management. The result is in line with Ostrom (2010) who said community will conserve and value the resource they benefit from.

Table 4.7: Government-State Conservation Control and Development Variables

Variable-composites	Mean	Std. Deviation	N
Government control and development	33.02	8.601	727
Decision making	5.01	1.580	727
Laws and bylaws formation	8.82	2.372	727
Patrols	9.01	2.492	727
Enforcement of bylaws and laws	5.71	1.590	727
Infrastructure development	4.48	1.837	727

Note: N-727

4.9.3 Decision making in Government-State Natural Resources Management

Impact of decision-making under government-state natural resources management approach on community economy computed mean was 5.01 (Table 4.7). The calculated mean was above strong mean of 3 (Table 3.3). The finding suggests strong impact on community economy from government natural resources management decision making. The study assessed who makes decisions whereby about half (48.8%) of respondents agreed that they are making decisions on how to use resources (Figure 4.20). Moreover, almost three-quarters (66.5%) of respondents agreed that they make decisions on how to use money gained from resource utilization (Figure 4.20).

The data suggest that community feels to be involved in government-state financial resources use. The data concurred with interviewed people's opinions on use of gained financial resources. One interviewed respondent who was a famous village chairperson from one of the villages around Greater Mahale Ecosystem, said when asked about who decides on money gained from conservation in government-protected areas programs, said:

> *"Any received money either from selling timber or from national park for villages development work, is always attached with where and how to use it. We, as beneficiaries prepare a budget of our priority*

and where we want to use that money. The natural resources officer or National Park officer guides us on money allocation. No money can be spent out of that plan. We are all conservationists".

That finding and community opinion indicated presence of a participatory approach to financial matters that may also imply presence of transparency. The result is in line with Franks & Small (2016) detailed stepwise of social assessment of protected areas (SAPA). Franks & Small (2016) concluded that when costs, benefits and social impacts arising from establishment and maintenance of protected areas and their distribution are shared, then conservation effectiveness increases.

4.9.4 Law Formation and Patrols in Government Natural Resources Control

Impact of laws and regulations formation under government-state natural resources management approach to community economy computed mean was 8.82 (Table 4.7). The computed mean was almost twice the expected mean of 5 (Table 3.3). The higher mean was associated with involvement of villagers in regulation formation and awareness created on enforcement such as fines levels to culprits. Figure 4.20 shows that, the majority (74.6%) of respondents agreed that are involved in formation of laws and regulations that safeguard the resources.

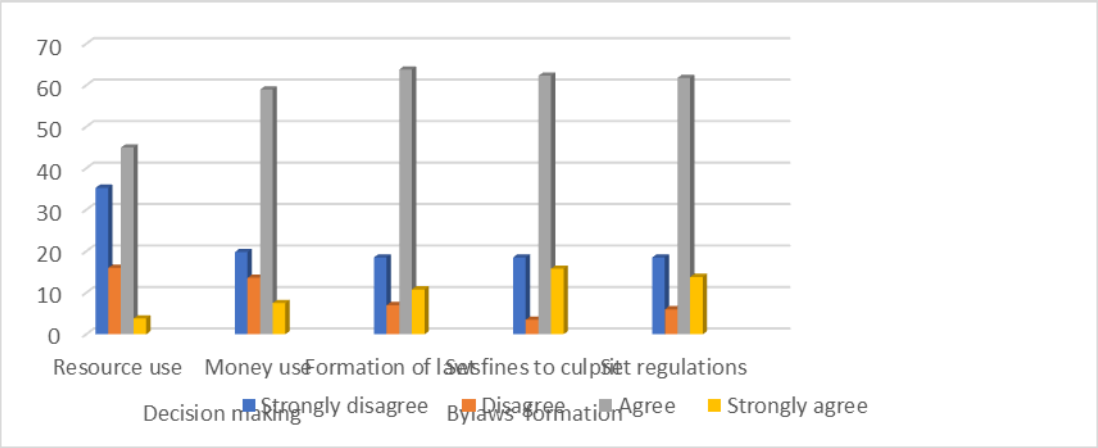

Figure 4.20: Decision-making and Laws in Government-State Conservation

Moreover, (78.1%) of respondents agreed that there are fines to culprit. This data suggests presence of strong controls that safeguard the government-state managed natural resources. Interviews with respondents confirmed the respect to laws and set fines in government-state conserved resources. One interviewed youth who escort chimpanzee trekking when asked about controls in government-conserved resources, said:

> *"All people in our community both farmers and livestock keepers respect protected natural resources boundaries. Forest guards and rangers in National Parks are very serious when either you trespass, or cattle are caught in a forest reserve or National Park. A caught person can pay a lot of finesor lose the cattle when caught in forest or national park. Sometimes they shoot a gun if they encounter serious resistance".*

Impact of patrols on government natural resources management to community economy computed mean was 9.01 (Table 4.7). Thatwas almost double of strong mean of 5 (Table 3.3). Even though patrol showed good mean, there were almost a quarter (22.8%) of respondents disagreed with implementation of regular and ambush patrol (Figure 4.21).

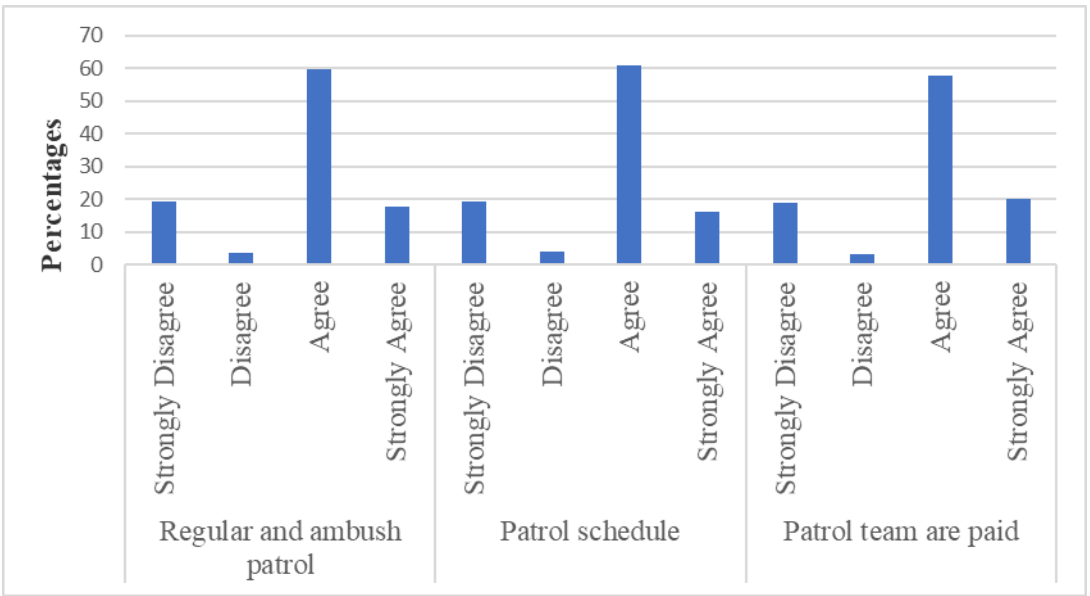

Figure 4.21: Patrol in Government-State Conservation Approach

Also, almost a quarter (22%) of respondents disagreed with presence of patrol schedule (Figure 4.21). Ambush patrol and patrol schedule signify quality of patrol and resource control. This finding suggests less quality patrol or those there are less participatory approaches in conducting patrols.

4.9.5 Law Enforcement and Infrastructure Development

Impact of enforcement and enactment of laws ingovernment-state natural resources management to community economy calculated mean was 5.71 (Table 4.7), slightly above strong mean of 5 (Table 3.3). Although this was a strong impact, the analyzed data showed that there was reservation on whether gained money were under good control or whether there was no favoritism. Figure 4.22 show more than a quarter (36%) of respondents disagreed that fines deposited in banks and 24% of respondents disagreed that fines are paid without favoritism. This finding may suggest presence of questionable financial transparency and may also indicate that the gained money may benefit a few advantaged ones.

The information was affirmed by an interview conducted with one district natural resources officer in one of the districts in Greater Mahale Ecosystem, who was asked about financial controls and transparency like placing reports on public notice boards, said:

> *"We do not issue protected area conservation financial report to community. We issue such reports to the district full council. Even though, when there is money to spend in a village from conservation gains, we convene a general meeting and seek consensus on the utilization of that money. We are not obliged to post the spending in the public notice."*

This result revealed that there is limited financial transparency even in government management of natural resources. Such limited transparency and fairness issues were

noted in community-based natural resources management (CBNRM) by Child & Barnes (2010) and Galvin *et al.* (2018). Moreover, law enforcement and patrols and accessibility require good infrastructure development.

Impact of infrastructure development in government-state natural resources management approach to community economy computed mean was 4.48 (Table 4.7). That was a weak mean just below the strong mean of 5 (Table 3.3). Respondents scored less on infrastructure development plans. Figure 4.22 showed that majority (three-quarters) disagreed that there were plans to develop infrastructures (76.3%).

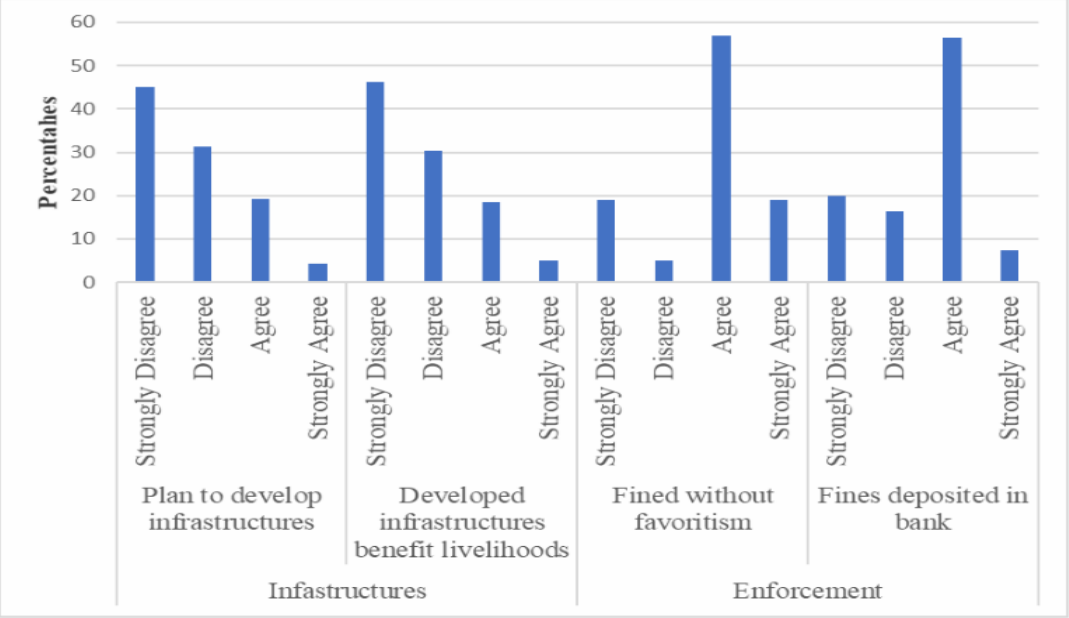

Figure 4.22: Enforcement and Infrastructure Development in State Conserved Area

Also, the majority (76.6%) disagreed that developed infrastructures benefitted community livelihoods. The finding suggested that the area have poor infrastructures development such as poor road networks. The information coincides with interviewed people. One popular businessman in a lower village around Greater

Mahale Ecosystem was interviewed. He was asked whether government conservation infrastructure development addresses community economic benefits, he showed concern about poor roads that affect their business as he said:

> *"We are doing business in hard environment. Some years back we used Lake Tanganyika as the only way to transport our consignments. However, few years ago we had a road connecting North to South from Kigoma to Kalya. Most of us use vehicles to transport our goods which takes fewer days compared to water transport. But, during rainfall season, there are bad parts of the road where vehicles cannot pass".*

4.10 Objective 7 Result: Comparison of different Conservation Approaches on Community Economic Benefit

4.10.1 Section Overview

This section reviews the research problem of different conservation approaches such as government-state or communal-indigenous conservation and between consumptive and non-consumptive models. This section addresses how effective either consumptive or non-consumptive, communal-indigenous or government-state natural resources management approaches are on community economic benefit. The section uses comparative approaches.

4.10.2 Government versus Communal Consumptive Conservation Approaches

4.10.2.1 Comparison by using Mean

Comparison between government-state and communal-indigenous consumptive natural resources management approaches, showed that government-state mean of 32.31 (Table 4.5) was slightly higher than communal-indigenous mean of 31.17 (Table 4.2). Both approaches were tested against same composites, and both had an expected strong mean of 33 (Table 3.3). Although both calculated mean were below the strong mean of Table 3.3, yet government-state consumptive approach mean was

higher than the communal-indigenous consumptive approach mean.

Although the two approaches'mean differences were not so huge, just 1 point above (31.17 against 32.31) it is a substantial difference considering that the research sample size (400) was bigger than the calculated Stevens (1996) research sample size (204). The bigger the sample size, the smaller the impact difference (Stevens, 1996). Therefore, the 1-point difference in calculated mean is a significant difference. The finding suggests that government-state consumptive natural resources management approach has stronger impact on community economic benefit (CEB) than the communal-indigenous consumptive natural resources management approach.

4.10.2.2 Comparison using Model Fit Test

Comparison of model predictability on impact of different natural resources management approaches on community economic benefit was done using data presented in Table 4.8. The presented data in Table 4.8 showed that the government-state consumptive natural resources management approach model fit adjusted R2 was 0. 63. The R2 of 0.63 was higher than the communal consumptive natural resources management approach model fit adjusted R2 of 0.54. That data implied that both models had good predictability on community economic benefit (CEB). However, the findings implied that government-state consumptive approach had a higher predictability (63%) on community economic benefit than communal - indigenous approach (54%). The findings suggest that to maximize community economic benefit, government-state natural resources management approaches are better than communal-indigenous ones.

4.10.2.3 Comparison using Multiple Regression Analysis

Multiple linear regression analysis between natural resources management approaches on community economic benefit presented in Table 4.9. The findings showed that government-state natural resources consumptive management approach was having highest impact to community economic benefit (CEB). Its regression coefficient B= 1.488, at 95% confidence interval-CI (1.404, 1.573), p=0.000, slightly above communal-indigenous consumptive natural resources management regression coefficient B= 1.431, at 95% confidence interval-CI (1.335, 1.527), p=0.000.

The findings show that increase in one unit of government-state natural resources management approach has higher impact (148%) in an increase in community economic benefit. While increase of one unit of communal-indigenous natural resource management approach will increase community economic benefit (CEB) by 143%. The difference between 148% and 143% is small (5%) to ignore the communal-indigenous natural resources management approach over the government-state natural resources management approach impact on community economic benefit (CEB).

4.10.3 Comparison between Government and Communal Non-Consumptive Conservation Approaches

4.10.3.1 Comparison using Mean

Comparison analysis of government-state and communal-indigenous non-consumptive natural resources management approaches impact on community economic benefit was conducted. The result showed that government-state non-consumptive approach means of 50.08 (Table 4.6) was higher than communal-

indigenous non-consumptive approach mean of 46.99 (Table 4.3). The data shows a 3 points difference between the two approaches which a significant difference is considering that the sample size (400) was higher than 204 which was Steven's calculated sample size (Steven, 1996).

The significance is stated because, the bigger the sample size, the smaller the difference (Steven, 1996), and here a difference of 3 points between the two approaches have been realized while a bigger sample size was applied. The finding suggests that government-state non-consumptive natural resources management approach have stronger impact on community economic benefit (CEB) than communal-indigenous non-consumptive natural resources management approach.

4.10.3.2 Comparison using Model Fit Test

Model fit test for non-consumptive natural resources management approach shown in Table 4.8, revealed that government-state approach adjusted Model fit R2 (0.78) was higher than communal-indigenous adjusted R2 (0.46). The data implied that government-state natural resources management approach predictability on community economic benefit (CEB) was very good (78%), while that of communal-indigenous approaches was only good (46%). The information suggests that, to maximize community economic benefit (CEB), government-state non-consumptive natural resources management approach model is better than communal-non-consumptive approach model.

4.10.3.3 Comparison using Multiple Regression Analysis

Multiple regression analysis comparison between government-state non–

consumptive and communal-indigenous non-consumptive natural resources management impact on community economic benefit (CEB) presented in Table 4.9. The data revealed that the former regression coefficient was smaller B= 1.132, at 95% confidence interval CI (1.088, 1.177), p=0.000, while the latter regression coefficient was higher B= 1.333, at 95% confidence interval CI (1.230, 1.440), p=0.000. The data suggest that increase of one unit of communal-indigenous non-consumptive natural resources management will have more impact (133%) on community economic benefit (CEB) than a 113% increase in government-state non-consumptive approach.

The revealed finding suggests that government-state non - consumptive approaches such as game-viewing tourism in National Parks are comparatively paying back less economic benefit to the community. The finding was supported by the recent enjoyed avoided deforestation and forest degradation REDD+ carbon credit payment in communal-indigenous forests which is proposed as better way of conservation financial paying back to the community (COP26, 2021). Communities in Ntakata forest around Greater Mahale Ecosystem were paid TZS 1.3 billion for a period of 6 months of forest conservation. Such payments are huge to be paid to villages every 6 months.

4.10.4 Control and Development Comparison between Government and Communal Conservation

4.10.4.1 Comparison using Model Fit Test

Comparison of natural resource control and development impact on community economics (CEB) model fit was presented in Table 4.8. The government-state

natural resources control development model fit test adjusted R2 was 0.57 higher than 0.36 of communal-indigenous approach. The difference presented moderate predictability on community economics benefit for both models with government-state natural resources management approach being stronger than communal-indigenous approach. The finding suggests that, to maximize community economic benefit (CEB) simultaneously with good natural resources management control practice, government-state control and development approach is better.

4.10.4.2 Comparison using Multiple Regression Analysis

Comparative analysis of control and development between government-state and communal-indigenous natural resources management approaches to community economic benefit presented in Table 4.9. The data showed that government-state control and development had strongest impact on community economic benefit (CEB) with coefficient of regression B= 2.04, at 95% confidence interval-CI (1.914, 2.171), p=0.000. While communal-indigenous control and development had the weakest regression coefficient B= 0.740, 95% CI (.391, 1.090), p=0.000. The information suggests that government-state control approach is the best in ensuring stronger management controls are in place while simultaneously resulting to higher community economic benefit (CEB).

4.10.5 Comparison between Consumptive and Non-Consumptive Conservation

The findings in Table 4.2 and Table 4.5 showed the strength of consumptive natural resources management approach's impact on community economic benefit which was stronger than non-consumptive approach's impact (Table 4.3 and Table 4.6). Multiple regression analysis for consumptive approaches showed to be highest than

non-consumptive approaches (Table 4.9). Multiple regression coefficient for consumptive government-state and communal-indigenous B= 1.488, at 95% confidence interval CI (1.404, 1.573), p=0.000, and B= 1.431, at 95% confidence interval CI (1.335, 1.527), p=0.000 respectively.

Whereas the regression coefficient for non-consumptive government-state and communal-indigenous B= 1.132, at 95% confidence interval CI (1.088, 1.177), p=0.000, and B= 1.333, 95% CI (1.230, 1.440) respectively. The findings suggest that natural resources consumptive approaches have a bigger impact (B= 1.488, and B=1.431) on community economic benefit (CEB) than non-consumptive approaches (B= 1.132, and B= 1.333). Even though the differences are significant yet are not so huge to ignore one approach over the other. The findings suggest that integration of natural resources management approaches can increase and maximize community economic benefit (CEB).

4.11 Econometric Model Analysis and Hypothesis

4.11.1 Section Overview

This section presented findings on model relationships through R Square. Model variable linear relationships were tested through Pearson (r). Whereas hypothesis testing was carried through multiple linear regression. The study had a null hypothesis (Ho): Terrestrial natural resources management approaches do not impact community economic benefit. The null hypothesis was rejected. To enable readers to follow through with the report, Tables and short paragraphs have been used to present argument on the model fit test, and multiple linear regression analysis that led to rejection of the null hypothesis.

4.11.2 Terrestrial Natural Resources Management-Ccommunity Economic Benefit Correlation Model Fit Test

The study developed a model of terrestrial natural resources management approaches on community economic benefit (CEB). The model had six independent variables that are composites of terrestrial natural resources management approach. Dependent variable was community economic benefit (CEB) as indicated in equation 6 of the study.

$$CEB = f \{\sum (CCT, CNC, CCD, GCT, GNC, GCD)\} \ldots\ldots\ldots\ldots\ldots\ldots (6)$$

The 6 independent variables shown in equation 6 above were communal consumptive (CCT), communal non-consumptive (CNC), communal control and development (CCD), government consumptive (GCT), government non-consumptive (GNC), and government control and development (GCD). Correlation model fit test R Square (R2) was computed for equation 6 and summarized in Table 4.8. The result showed that all 6 independent variables composite of terrestrial natural resources management approaches had a positive relationship with community economic benefit (Table 4.8).

Table 4.8: R square (R2) – Model Fit Summary

Model and approaches	R	R Square	Adjusted R Square	SE
Communal consumptive	.734	.539	.538	15.701
Communal non-consumptive	.680	.462	.462	17.001
Communal controls	.601	.361	.357	18.565
Government-state consumptive	.791	.625	.625	14.200
Government-state non-consumptive	.882	.778	.777	10.935
Government-state control	.758	.575	.574	15.121

Note: R Square =R2 and SE = Standard Error of the Estimate.

4.11.2.1 Communal Consumptive Conservation Correlation

Communal-indigenous consumptive natural resources management approach (CCT) correlated to community economic benefit (CEB). Correlation model fit test was calculated. The study R Square (R2) correlation model fit test is summarized in Table 4.8. The result showed that communal-indigenous consumptive resources utilization adjusted R Square was 0.54. The R Square of 0.54 is 54% explicated variation in community economic benefit that is explained by inclusion of communal-indigenous consumptive utilization. The model has a good but not very strong R2 of 0.54 and therefore it has a moderate predictive ability (54%) as ranked by Almquist, Ashira & Brännström (2019) and Profillidis & Botzoris (2019).

4.11.2.2 Communal non-Consumptive Conservation Correlation

Communal-indigenous non-consumptive natural resources management (CNC) correlated to community economic benefit (CEB). Correlation model fit test was calculated. Communal-indigenous non-consumptive resources utilization adjusted R Square of 0.46 was computed (Table 4.8). The R Square is 46% explicated variation in community economic benefit that is explained by inclusion of communal-indigenous non-consumptive utilization. The model has poor R2 of 0.46 and therefore it has weak predictive ability (46%) as ranked by Almquist, Ashira & Brännström (2019). The result suggests weak predictivity ability of communal non-consumptive natural resources utilization impact on community on CEB.

4.11.2.3 Communal Conservation Control - Development Correlation

Communal-indigenous natural resources management control and development (CCD) correlated to community economic benefit (CEB). The study R Square (R2)

correlation model fit test is summarized in Table 4.8. Computed adjusted R Square of communal control was 0.36 (Table 4.8). That is a 36% explicated variation in community economic benefit that is explained by inclusion of communal control. The R2 result for communal-indigenous control showed weakest predictivity ability of 36%. The result suggests a weak ability of community to manage natural resources that produce economic benefit. Weak natural resources control by communal-indigenous people was attested by interviewed government officers. One of interviewed natural resources government officer in one district of Greater Mahale Ecosystem, had this to say when asked on ability and quality of communal-indigenous natural resources control, he said:

> *"Community cannot control natural resources without government intervention because when there are forests intruders, villages request district government to expel intruders".*

4.11.2.4 Government Consumptive Conservation Correlation

Government-state consumptive natural resources management (GCT) correlated to community economic benefit (CEB). Calculated correlation model fit test was summarized in Table 4.9. Government-state consumptive natural resources utilization model fit adjusted R Square of 0.63 was computed (Table 4.8). The R Square of 0.63 is 63% explicated variation in community economic benefit that is explained by inclusion of government-state consumptive utilization. The model has good R2 of 0.63 and therefore it has good (63%) predictive ability in accordance with Almquist, Ashira & Brännström, (2019) and Profillidis & Botzoris (2019).

4.11.2.5 Government non-Consumptive Conservation Correlation

Government-state non-consumptive natural resources management approach (GNC)

correlated to community economic benefit (CEB). Correlation model fit test was calculated. Adjusted R Square (R2) correlation model fit test is summarized in Table 4.8. The result showed government-state non-consumptive resources utilization adjusted R Square of 0.78. The R Square is 78% explicated variation in community economic benefit that is explained by inclusion of government-state non-consumptive utilization. The model has very good R2 of 0.78 and therefore it has a strong (78%) predictive ability in line with Almquist, Ashira & Brännström (2019) and Profillidis & Botzoris (2019). The result suggests strong predictivity ability of government-state non-consumptive natural resources utilization impact on community economic benefit.

4.11.2.6 Government Conservation Control - Development Correlation

Government-state natural resources management control and development (GCD) correlated to community economic benefit (CEB). The study R Square (R2) correlation model fit test is summarized in Table 4.8. Adjusted R Square of government-state control and development was 0.57 (Table 4.8). That is 57% explicated variation in community economic benefit that is explained by inclusion of government-state control. The R2 result for government-state control and development showed good (57%) predictivity ability as per Almquist, Ashira & Brännström (2019) and Profillidis & Botzoris (2019).

4.11.2.7 Comparative Correlation of Model Fit Test

All 6 natural resources management approaches have positive correlation relationships with community economic benefit (CEB). Comparatively there are higher adjusted R Square for government-state conservation approaches compared to

communal-indigenous conservation approaches (Table 4.8). Adjusted R Square of government-state non-consumptive and government-state consumptive was the highest at 0.78 and 0.63 respectively (Table 4.8). The findings suggest that government-state natural resources management approach model has better predictivity ability on community economic benefit.

4.11.3 Linear relationship for Independent Variables to Dependent Variable

The study's independent variable of terrestrial natural resources management approach had 6 composites. Test of linear relationships between independent variables' 6 composites shown in equation 6 with community economic benefit (CEB) was carried out by performing Pearson (r) covariance statistical relationship correlation. Tested independent variables composites were communal consumptive (CCT), communal non-consumptive (CNC), communal control and development (CCD), government consumptive (GCT), government non-consumptive (GNC), and government control and development (GCD). Linear correlation of individual independent variable composites with community economic benefit (CEB) was performed. This test was important to know whether the independent variable composite has a linear relationship with the dependent variable (CEB) before it is included in multiple linear regression analysis. All 6 composites were found to have a positive linear correlation relationship with community economic benefit (CEB).

The Pearson (r) covariance statistical relationship correlation coefficient between communal–indigenous consumptive natural resources management (CCT) and community economic benefit (CEB) calculated. The result was Pearson -r (733) = .73, $p<.001$. The positive Pearson (r) above 0.7 implied that relationship was strong

correlation as per Almquist, Ashira & Brännström (2019) and Profillidis & Botzoris (2019) ranking and interpretation of Pearson (r). Whereas communal-indigenous non-consumptive natural resources management (CNC) relationship correlation with community economic benefit (CEB) was Pearson -r (728) = .68, p<.001.

The positive Pearson (r) above 0.6 and close to 0.7 shows that the relationship was not very strongly correlated (Profillidis & Botzoris, 2019). Whereas relationship correlation coefficient between communal-indigenous natural resources management control and development (CCD) and community economic benefit (CEB) was Pearson -r (733) = .56, p<.001. The positive Pearson (r) below 0.6 implied that relationship was a weak correlation and that the model has weak predictive ability in line with Almquist, Ashira & Brännström (2019) and Profillidis & Botzoris (2019).

The relationship correlation coefficient between government-state consumptive natural resources management (GCT) and community economic benefit (CEB) was Pearson (r) (722) = 0.79, p<.001. The positive Pearson (r) above 0.7 implied that relationship was a strong correlation (Profillidis & Botzoris, 2019). While relationship correlation coefficient between government-state non-consumptive natural resources management (GNC) and community economic benefit (CEB) was Pearson -r (716) = .88, p<.001. The positive Pearson (r) above 0.7 implied that relationship was strong correlation and that the model has very good and very strong predictive ability (Profillidis & Botzoris, 2019). Whereas relationship correlation coefficient between government-state natural resources management control and development (GCD) and community economic benefit (CEB) was Pearson -r (728) = .89, p<.001. The positive Pearson (r) above 0.7 implied that relationship was strong

correlation and that the model has a very good and very strong predictive ability in line with Profillidis & Botzoris, 2019.

4.11.4 Hypothesis testing and Multiple Linear Regression Analysis

The study had a general null hypothesis and 6 specific null hypotheses. All null hypotheses were rejected in favor of alternative hypothesis. Multiple linear regression model was developed for variables of terrestrial natural resources management approaches to community economic benefit (CEB). The 6 independent variables of terrestrial natural resources in equation 8 below were communal consumptive (CCT), communal non-consumptive (CNC), communal control and development (CCD), government consumptive (GCT), government non-consumptive (GNC), and government control and development (GCD).

$$CEB = \beta_0 + \beta_1 CCT + \beta_2 CNC + \beta_3 CCD + \beta_4 GCT + \beta_5 GNC + \beta_6 GCD + \ldots + \varepsilon i \ldots \quad (8)$$

Coefficient of regression (β) was computed for all six variables of the model through a multiple linear regression analysis. Performed multiple linear regression analysis on natural resources management impact(β) to community economic benefit (CEB) is presented in Table 4.9. The result showed that regression coefficient B were positive for all 6 models with statistically significant p= 0.000. The data did not include a null value (x=0), which was a main reason to reject null hypothesis in favor of the alternative hypothesisas stated by Almquist, Ashira & Brännström (2019) and Profillidis & Botzoris (2019).

The findings on positive regression coefficient B implied that, an increase of one unit of any model is associated with an increase in community economic benefit

(CEB). The finding showed that government-state consumptive utilization model had the highest regression coefficient B of conservation utilization approach impact on community economic benefit (CEB). Moreover, government-state control approach had the highest coefficient B of control approach impact on community economic benefit (CEB). However, differences in regression coefficient B among the 6 models were slightly little to neither support one side of conservation approach school of thought in an independent way.

Table 4.9: Multiple Linear Regression Analysis

Approaches	B	95% CI	β	t	p	SE
Communal consumptive	1.431	1.335, 1.527	.734	29.242	.000	.049
Communal non-consumptive	1.335	1.230, 1.440	.680	24.985	.000	.053
Communal controls	.740	.391, 1.090	.152	4.160	.000	.178
Government-state consumptive	1.488	1.404, 1.573	.791	34.667	.000	.043
Government-state non-consumptive	1.132	1.088, 1.177	.882	49.988	.000	.023
Government-state control	2.043	1.914, 2.171	.758	31.305	.000	.065

Note. CI = Confidence Interval for B, SE = Standard Error, p=0.000

4.11.4.1 Null hypothesis H_1

Null hypothesis H_1 states that communal-indigenous consumptive terrestrial natural resources management approach does not have statistically significant impact on community economic benefit. Multiple regression analysis was performed on communal consumptive natural resources management impact to community economic (Table 4.9). The result showed that regression coefficient B= 1.43 at 95% confidence interval (CI) = 1.34, 1.53; p=0.000. The interpretation is that, increase of one unit of communal consumptive model is associated with an increase of 1.43 community economic benefit (CEB). Because p<5% and confidence interval (CI) does not include null value (x=0) it is statistically significant at the 5 % level.

The findings above were sufficient evidence against null hypothesis (H_1) that stated communal-indigenous consumptive terrestrial natural resources management approach does not have statistically significant impact on community economic benefit. Therefore, null hypothesis (H_1) was rejected, in favor of alternative hypothesis. The result suggests that it could be true that communal-indigenous consumptive terrestrial natural resources management approach may have statistically significant impact on community economic benefit.

4.11.4.2 Null Hypothesis H_2

Null hypothesis H_2 states that communal-indigenous non-consumptive terrestrial natural resources management approach has no statistically significant impact on community economic benefit. Multiple regression analysis was performed on communal non-consumptive natural resources management impact to community economic benefit (Table 4.9). The result showed that regression coefficient B= 1.34 at 95% at confidence interval (CI) = 1.23, 1.44; p=0.000. This means increase in one unit of communal non-consumptive utilization, community economic benefit (CEB) increases by 1.34 (134%). Because p<5% and confidence Interval (CI) does not include null value (x=0), it is statistically significant at the 5 % level.

The above findings were sufficient statistical evidence against null hypothesis (H_2) that stated communal-indigenous non- consumptive terrestrial natural resources management approach does not have statistically significant impact on community economic benefit. Therefore, null hypothesis (H_2) was rejected, in favor of alternative hypothesis. The result suggests that it could be true that communal-indigenous non-consumptive terrestrial natural resources management approach

may have statistically significant impact on community economic benefit.

4.11.4.3 Null Hypothesis H_3

Null hypothesis H_3 states that communal-indigenous terrestrial natural resources management control and development has no statistically significant impact on community economic benefit. Multiple regression analyses performed on communal natural resources management control and development impact on community economic benefit (Table 4.9). The finding was regression coefficients B= 0.74 at 95% confidence interval (CI) = 0.39, 1.09; p=0.000. The data implied that as one unit increase of communal natural resources control and development, community economic benefit (CEB) increases by 0.74 (74%). Because p<5% and confidence interval (CI) does not include null value (x=0), it is statistically significant at 5 % level.

The realized findings above were sufficient evidence against null hypothesis (H_3) that stated communal-indigenous terrestrial natural resources management control and development approach does not have statistically significant impact on community economic benefit. Therefore, null hypothesis (H_3) was rejected, in favor of alternative hypothesis. The result suggests that it couldbe true that communal-indigenous terrestrial natural resources management control and development approach may have statistically significant impact on community economic benefit.

4.11.4.4 Null Hypothesis H_4

Null hypothesis H_4 states that government-state consumptive terrestrial natural resources management approach has no statistically significant impact on

community economic benefit. The study conducted multiple regression analysis on government-state consumptive natural resources management impact to community economic benefit (Table 4.9). Analysis showed regression coefficient B= 1.49 at 95% confidence interval (CI) = 1.4, 1.57; p=0.000. The findings implied that with one unit increase of government consumptive utilization of natural resources, community economic benefit increases by 1.49 (149%) and because p<5% and the confidence interval (CI) do not include null value (x=0) it is statistically significant at the 5 % level.

The above-reported findings were sufficient evidence against null hypothesis (H_4) that stated government-state consumptive terrestrial natural resources management approach does not have statistically significant impact on community economic benefit. Therefore, null hypothesis (H_4) was rejected, in favor of alternative hypothesis. The result suggests that it could be true that government-state consumptive terrestrial natural resources management approach has statistically significant impact on community economic benefit.

4.11.4.5 Null Hypothesis H_5

Null hypothesis H_5: Government-state non-consumptive utilization of terrestrial natural resources management approach has no statistically significant impact oncommunity economic benefit. The study conducted multiple regression analysis on government-state non-consumptive natural resources management impact to community economic benefit (Table 4.9). Regression coefficient B was positive for non-consumptive with statistically significant p= 0.000. It was found that regression coefficients B= 1.13 at 95% confidence interval (CI) = 1.09, 1.18; p=0.000. This

implied that increase of one unit of government-state non-consumptive natural resources management, community economic benefit increases by 1.13 (113%) and because p<5% and confidence interval (CI) does not include null value (x=0) it is statistically significant at the 5 % level.

The above study findings were sufficient evidence against null hypothesis (H_5) stated that government-state non-consumptive terrestrial natural resources management approach does not have statistically significant impact on community economic benefit. Therefore, null hypothesis (H_5) was rejected, in favor of alternative hypothesis. The result suggests that it couldbe true that government-state non-consumptive terrestrial natural resources management approach have statistically significant impact on community economic benefit.

4.11.4.6 Null Hypothesis H_6

Null hypothesis H_6 states that government-state terrestrial natural resources management control and development has no statistically significant impact on community economic benefit. Multiple regression analysis performed on government-state natural resources management impact to community economic benefit (CEB) is presented in Table 4.9. Regression coefficients B= 2.04 at 95% confidence interval (CI) = 1.91, 2.17; p=0.000 realized. The data implied that as one unit of government-state natural resource control increase, community economic benefit increases by 2.04 (204%) and because p<5% and confidence interval (CI) does not include null value (x=0) it is statistically significant at 5 % level.

The exposed above findings were sufficient evidence against null hypothesis (H_6) that stated government-state terrestrial natural resources management control and

development approach does not have statistically significant impact on community economic benefit. Therefore, null hypothesis (H_6) was rejected, in favor of alternative hypothesis. The result suggests that it could be true that communal-indigenous terrestrial natural resources management control and development approach may have statistically significant impact on community economic benefit.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 Chapter Overview

This chapter presents research conclusion and provides recommendations. The conclusion is based on empirical results. Conclusion referred to the research objectives and research problem statement. The recommendations focused on proposed possible areas for improvement to maximize community economic benefit while addressing natural resources management utilization, controls, and development.

5.2 Conclusions

The general conclusion of this study is that community economic benefit (CEB) is impacted by all approaches of terrestrial natural resources management, however, at a different magnitude. The study also concludes that even though all natural resources management approaches have positive impacts on community economic benefits, government-state consumptive approaches and government-state controls have the highest magnitude of impact on community economic benefit. The study concludes that even though other natural resources management approaches have significant contributions to CEB, it is economically wise to include consumptive natural resources approaches whenever there is intention to improve community economic benefits.

Moreover, the study concludes that communal-consumptive natural resources management approache shave higher impacts on community economic benefit (CEB) compared to non-consumptive models. However both communal-

consumptive and communal-non-consumptive approaches have a relatively low impact on CEB compared to government-state natural resources management approaches. The study concludes that both communal-consumptive and non-consumptive management approaches should not be ignored to maximize CEB.

This study concludes that government-state consumptive approaches had a bigger impact on community economic benefit (CEB) compared to non-consumptive approaches. Even though relatively lower in comparison to consumptive utilization, non-consumptive utilization models also have significant impact on community economic benefit (CEB). However, the difference in magnitude of the impact between the two approaches was small and does not guarantee to reject one approach in favor the other. Therefore, in choosing a natural resources management approach, economic analysis should be a priority and consumptive utilization such as Game Reserve should be given a high priority.

Moreover, the study concludes that remoteness and poorly developed infrastructures such as roads have been the main factors that affect realization of both consumptive and non-consumptive conservation economic benefit in Greater Mahale Ecosystem (Appendix VI). Inaccessibility makes communities not economically benefiting from their natural resources.

5.3 Recommendations

The study recommends that a hybrid combo of consumptive and non-consumptive natural resources management guidelines should be formulated. The hybrid combo of natural resources management approaches should integrate the communal-

indigenous and government-state model to benefit strength of both approaches. The integration should also be on utilization approaches to include both consumptive and non-consumptive approaches. Such integration could be introduction of integrated livestock keeping ranches in forest reserves. Another possible integration could be zooning for underground mining within National Parks. Moreover, integration can be focusing on avoided carbon credit, carbon sequestration credit and sustainable timber for logging or wildlife management area with livestock grazing ranches. The integration of government-state and communal-indigenous natural resources management approaches can focus on co-management and review of centralization and decentralization in natural resources management.

The study recommends that improving the Western Tanzania tourist circuit is necessary to tap into that low-hanging ripe fruit opportunity of the circuit. The relatively few hunting tourist activities in Greater Mahale Ecosystem (GME) should be developed. Development of tourist hunting blocks will improve consumptive utilization under government-state approach and most likely will benefit the Nation and surrounding community. Connectivity infrastructures such as roads should be developed in the Western Tanzania tourist circuit that enhances Western Tanzania Ecosystem (WTE). This will benefit not only Greater Mahale Ecosystem community economics, but also the country GDP by bringing more tourists to the area.

The Western Tanzania tourist circuit can be linked with Western Tanzania Ecosystem (WTE) conservation network. To develop such a tourist circuit a one-stop tourist center can be developed in the country say in central Tanzania. Furthermore, this study recommends undertaking natural resources valuation in Greater Mahale

Ecosystem (GME) and whenever possible in the whole country of Tanzania to advise integrated conservation approaches. The study recommends undertaking Total Economic Valuation (TEV). Undertaking TEV will enhance Tanzania country knowledge of its natural capital, natural asset, and real wealth. Understanding how wealthy the country is will enable realistic development plans. Natural resources are natural capital and the country's real wealth.

Because this study was limited by scope, the study also recommends carrying out more studies in bigger area coverage onconservation approaches benefit to community economy. Because this study was limited to microeconomics only, therefore, the study also recommends carrying out further studies on macro economic benefit of natural resource management approach. This study was also limited to terrestrial natural resources; therefore, the study recommends further studies on aquatic natural resources management both in freshwater and on salty water.

REFERENCES

Ahmed, M. (2004). *Principle of Environmental Economics*. London: Taylor and Francis group.

Almquist, Y. B., Ashir S. & Brännström, L. (2019). A guide to quantitative methods. Stockholm University, Sweden.

Amira, S., Osmana, M. M., Bachoka, S. & Ibrahima, M. (2015). *Sustaining local community economy through tourism:* Melaka UNESCO world heritage city. The 5th Sustainable Future for Human Security (SustaiN 2014), *Procedia Environmental Sciences,* 28, 443-452.

Andam, K. S., Ferraro, P. J., Sims, K. R. E., Healy, A. & Holland, M. B. (2010). *Protected areas reduced poverty in Costa Rica and Thailand*: Proceedings of the National Academy of Sciences, USA 107: 9996–10001.

Anderson, D. A. (2010). *Environmental economics and Natural Resource* Management. Oxon: Routledge.

Andika, G. (2020). Economic growth dynamics between resource-rich and resource-poor countries in Sub-Saharan Africa: The role of politics and institutions. *African Development review Journal,* 32(3), 303-315.

Arrow, K. B., Bolin, R., Constanza, P. Dasgupta, C., Folke, C. S., Holling, B. O., Jansson, S., Levin, K. G., Maler, C., Perrings, & Pimentel, D. (1995). *Economic growth, carrying capacity and the environment Science,* 268, 520–521.

Barbier, E. B. (2007). *Natural resource and Economic Development*.Cambridge Cambridge: University Press.

Bluwstein, J. (2017). Creating ecotourism territories: Environmentalities in

Tanzania's community-based conservation. *Geoforum*, 83, 101–113.

Bluwstein, J., Moyo, F. & Kicheleri, R. P. (2016). Austere conservation: understanding conflicts over resource governance in Tanzanian wildlife management areas. *Conservation and Society,* 14(3), 218–231.

CAP, (2011). Conservation Action Plan report. Conservation Action Plan for Western Tanzania. The Nature Conservancy. CAP.

Carl, F. & Tomas, K. (1991). *Recent Trends in Linking the Natural Environment and the Economy*. Gothenburg: Kluwer Academic Publishers.

Cavendish, W. & Campbell, B. M. (2005). *Poverty, environmental income and rural inequality*: A case study from Zimbabwe

CBD, (2011). Convention on Biological Diversity, Decision Adopted by the Conference of the Parties to the Convention on Biological Diversity at its Tenth Meeting [Decision X/2]. CBD.

Child, B. & Barnes, G. (2010). The conceptual evolution and practice of community-based natural resource management in southern Africa: Past, present and future. *Environmental Conservation,* 37(3), 283-295.

Cook, C. N., Carter, R. W. & Hockings, M. (2014). Measuring the accuracy of management effectiveness evaluations of protected areas'. *Journal of Environmental Management*, 139, 164–71.

Coulter, G. W. (1994). Lake Tanganyika: Speciation in ancient lakes. Edited by Martens K., Goddeeris, B. and Coulter G. *Archiv fur Hydrobiology,* 44, 13–18.

Darling, F. (1964). Conservation and Ecological Theory. *Journal of Animal Ecology, 33*, 39-45.

Davis, A. L., Blomley, T., Homer, G., Sommerville, M. & Nelson, F. (2019). *Community-based natural resource management in Zambia: A review of institutional reforms and lessons from the field*. Lusaka: Maliasili, ILRG and the Nature Conservancy.

Defra-Department for Environment, Food and Rural Affairs, (2007). *An introductory guide to valuing ecosystem services*. London: Department for Environment, Food and Rural Affairs.

Dressler, W., Buscher, B., Schoon, M., Brockington, D., Hayes, T., Kull, C. A., McCarthy, J. & Shrestha, K. (2010). From hope to crisis and back again? A critical history of the global CBNRM narrative. *Environmental Conservation*, 37, 5–15.

Ellis, F. & Allison, E. (2004). Access to Natural Resources Sub-Programm: Livelihoods Diversification and Enterprise Development Sub-programme. LSP Working Paper 9. Overseas Development Group University of East Anglia UK.

Franks, P. & Small, R. (2016). *Social Assessment for Protected Areas (SAPA)*. Methodology Manual for SAPA Facilitators. London: IIED.

Galvin, K. A., Beeton, T. A. & Luizza, M. W. (2018). African community-based conservation: A systematic review of social and ecological outcomes. *Ecology and Society*, 23(3), 39.

Gravetter, F. J. & Forzano, L. B. (2012). *Research Methods for the Behavioral Sciences*, 4th Ed., Belmont, CA: Wadsworth.

Gujarati, N. (2004). *Basic Econometrics*. 3rd Edition. New York: McGraw-Hill Book Company.

Hall, J. M., Rantala, N. D., Vihemäki, S., Jambiya, H., Gereau, G., Makonda, R. E., Njilima, F., Sumbi, F. & Kizaji, A. (2014). Ecological and social outcomes of a new protected area in Tanzania: Conservation Biology.

Hardee, K., Patterson, K. P., Schenck-Fontaine, A., Hess, S., Leisher, C., Mutunga, C., Margoluis, C. & Honzak, C. (2018). *Family planning and resilience:* Associations found in a Population, Health, and Environment (PHE) project in Western Tanzania. *Popul Environ,* 40(2), 204-238.

Hardin, G. (1968). The tragedy of commons. Science, 162(3859, 1243-1248.

Heo, M., Kim, N. & Faith, M. S. (2015). Statistical power as a function of Cronbach alpha of instrument questionnaire items. *BMC Med Res Methodol,* 15(86).

Hutton, J., Adams, W. M. & Murombedzi, J. C. (2005). Back to the barriers? Changing narratives in biodiversity conservation. *Forum for Development Studies,* 2, 341–370.

IUCN-International Union for Conservation of Nature, (2017). UN Main Conference Hall, UNDP Tanzania Country Office, Dar es Salaam, 21st - 22nd March, 2017.

John, J., Kohi, E., Park, J., Nkwabi, A., Choi, C., Warema, C., Hur, W., Kim, H. & Lee, J. (2019). Birds of Western Tanzania. National Institute of Biological Resources, Tanzania Wildlife Research Institute (TAWIRI), Printed in the Republic of Korea.

Kaijage, E. (2016). *Tanzania mapping REDD+ and Finance Flows 2009–2014:* Environment Division, Vice President's Office, United Republic of Tanzania.

Kaimowitz, D. & Sheil, D. (2007). *Conserving what and for whom:?* Why conservation should help meet basic human needs in the tropics. *Biotropica,*

39, 567–574.

Keane, A., Lund, J. F., Bluwstein, J., Burgess, N. D., Nielsen, M. R. & Homewood, K. (2020). Impact of Tanzania's Wildlife Management Areas on household wealth. *Nature Sustainability*, 3, 226–233.

Keough, H. L. & Blahna, D. J. (2006). Achieving Integrative, Collaborative Ecosystem Management: Logrando la Gestión Integradoray Cooperativa de Ecosistemas.

Kerapeletswe, C. K. & Lovett, C. J. (2005). *The role of common pool resource (CPR) in economic welfare of rural household.* University of York: Environmental Department.

Leisher, C. & Hess, S. (2017). *Tuungane midterm review and evaluation. Tuungane Outcome analysis:* The Nature Conservancy and Pathfinder International.

Lewis, E., MacSharry, B., Juffe-Bignoli, D., Harris. N., Burrows, G., Kingston, N. & Burgess, N. D. (2017). *Dynamics in the global protected-area estate since 2004*: Society for Conservation Biology. Cambridge CB2 3EN, U.K.

McCormick, R. & Fuwa, C. (2015). The Effects of Land Conservation on Productivity. *Journal of Environmental andResource Economics at Colby*: 2(1), 1-12.

McShane, T. O., Hirsh, P. D., Trung, T. C., Songorwa, A. N., Kinzig, A., Monteferri, B., Mutekanga, D., Thang, H. V., Dammert, J. L. & Pulgar-Vidal, M. (2010). *Hard choices:* making trade-offs between biodiversity conservation and human well-being. *Biological Conservation*, 144, 966–972.

MEA-Millennium Ecosystem Assessment, (2005). *Ecosystems and human well-being: Synthesis*. Washington, DC: Island Press.

Milner-Gulland, E. J. (2012). *Interactions between human behaviour and ecological systems. Philosophical Transactions of the Royal Society*, 367, 270–278.

Morrison, T. A., Link, W. A., Newmark, W. D., Foley, C. A. H. & Bolger, D. T. (2016). Tarangire revisited: Consequences of declining connectivity in a tropical ungulate population. *Biological Conservation, 197*, 53–60.

Mosimane, A. W. & Silva, J. A. (2015). Local governance institutions, CBNRM, and benefit-sharing systems in Namibian conservancies. *Journal of Sustainable Development*, 8(2), 99.

Moyo, F., Funk, S. & Pretzsch, J. (2017). *Between policy intent and practice*: Negotiating access to land and other resources in Tanzania's Wildlife Management Areas. *Tropical Conservation Science*, 10, 194008291774416.

Murphree, M.W. (2009). The strategic pillars of communal natural resource management: benefit, empowerment and conservation. *Biodiversity Conservation*, 18, 2551–2562.

Muyengwa, S. & Child, B. (2017). Re-assertion of elite control in Masoka's wildlife program, Zimbabwe. *Journal of Sustainable Development*, 10(6), 28.

NESR, (2017). Environmental statistics, National Environment Statistics Report. Dar es Salaam, Tanzania Mainland.

Nkonya, E., Pender, J., & Kato, E. (2008). Who knows, who cares? The determinants of enactment, awareness, and compliance with community Natural Resource Management regulations in Uganda. *Environment and Development Economics*, *13*(1), 79-101.

Novikov, A. M. & Novikov, D. A. (2013). *Research Methodology; from Philosophy of Science to Research Design*. Volume 3. Boca Raton: CRC Press,

Taylor & Francis Group.

Oduor, A. M. (2020). Livelihood impacts and governance processes of community-based wildlife conservation in Maasai Mara ecosystem, Kenya. *Journal of Environmental Management,* 260, 110133.

Ostrom, E. (2010). The Challenge of common-pool resources. In: *Environment: Science and Policy for Sustainable Development,* 50, 4, 8-21.

Pailler S., Naidoo R., Burgess N.D., Freeman O.E. & Fisher B. (2015*). Impacts of Community-Based Natural Resource Management on Wealth, Food Security and Child Health in Tanzania*. PLoS ONE 10(7): e0133252.

Parrish, J., Braun, D. P. & Unnasch, R. S. (2003). *Are we conserving what we say we are*: measuring ecological integrity within protected areas', *BioScience*, 53, 851.

Piel, A. K., Stewart, F. A., Pintea, L., Li Y., Ramirez, M. A. & Loy, D. E. (2013). The Malagarasi River does not form an absolute barrier to chimpanzee movement in western Tanzania, *PLoS One,* 8(3), e58965.

Pigou, A. C. (1920). *The economics of welfare*. London: Macmillan.

Profillidis, V. A. & Botzoris G. N. (2019). *Modeling of Transport Demand. Analyzing, Calculating, and Forecasting Transport Demand.* Amsterdam: Elsevier Inc.

Ribot, J.C. (2003). *A Theory of Access:* Institutions and Governance Program. World Resources Institute. Department of Environmental Science, Policy and Management.Division of Society and Environment. *University of California,* 68(2), 153–181.

Roe, D., Nelson, F. & Sandbrook, C. (2009). *Community Management of Natural*

Resources in Africa: Impacts, Experiences and Future Directions. IIED, London.

Rosser, A. M. & Leader-Williams, N. (2010). Protection or use: A case of nuanced tradeoffs? In *Trade-offs in Conservation: Deciding What to Save*, N. Leader-Williams, W. M. Adams and R. J. Smith (Eds.), 135–156. Oxford: Blackwell Publishing.

Russell, S., Tyrrell, P. & Western, D. (2018). Seasonal interactions of pastoralists and wildlife in relation to pasture in an African savanna ecosystem. *Journal of Arid Environments,* 154, 70–81.

Saunders, F. (2014). The promise of common pool resource theory and the reality of commons projects. *International Journal of the Commons, 8*(2), 636-656.

Scherl, L., Wilson, A., Wild, R., Blockhus, J., Franks, P., McNeely, J. & McShaneCan, T. (2004). *Protected Areas Contribute to Poverty Reduction*? Opportunities and Limitations. Cambridge: IUCN Publications.

Scitovsky, T. (1976). *The Joyless Economy:* An Inquiry into Human Satisfaction and Consumer Dissatisfaction. Oxford: Oxford University Press.

Stacey, N., Izurieta, A. & Garnett, S. T. (2013). Collaborative measurement of performance of jointly managed protected areas in northern Australia. *Ecology and Society*, 18(1), 19.

Steffen W., Richardson, K., Rockström, J., Cornell, S. E., Fetzer, I., Bennett, E. M., Biggs, R., Carpenter, S. R., Vries, W. De, Wit, C. A. De, Folke, C., Gerten, D., Heinke, J., Mace, G. M., Persson, L. M., Ramanathan, V., Reyers, B. & Sörlin, S. (2015). *Planetary boundaries*: Guiding human development on a changing planet', *Science,* 347/6223, 1–10.

Stevens, J. (1996). *Applied multivariate statistics for the social sciences*. Mahwah, NJ: Lawrence Erlbaum Associates.

Sulle, E. & Banka, H. (2017). Tourism taxation, politics and territorialization in Tanzania's wildlife management. *Conservation & Society,* 15, 465–473.

TAWIRI-Tanzania Wildlife Research Institute, (2018). Tanzania Chimpanzee Conservation Action Plan 2018-2023, TAWIRI.

Taylor, A. (2011). *Ecosystems, development, and climate adaptation: Improving the knowledge base for policies, planning and management.* Oxford: Stockholm Environmental Institute.

Tchakatumba, T. E., Gandiwa, E., Mwakiwa, B. & Nyasha, S. (2019). Does the CAMPFIRE programme ensure economic benefits from wildlife to households in Zimbabwe? *Journal of Ecosystems and People,* 15(1), 119–135.

Tietenberg, T. (2012). *Environmental and Natural Resource Economics*: Pearson Education, NC., Addison-Wesley.

Tyrrell, P., du Toit, J. T. & Macdonald, D. W. (2019). *Conservation beyond protected areas:* Using vertebrate species ranges and biodiversity importance scores to inform policy for an east African country in transition. Conservation Science and Practice.

UN, (2021). Glasgow Climate Change Conference, Conference, October - November 2021. UN.

UNEP-WCMC & IUCN, (2018). The lag effect in the World Database on Protected Areas: retrieved on 12th December, 2022 from; https://www.protectedplanet.net/.../the-lag-effect-in-the-world-databse-on-

protected-a(retrieved10th March 2019).

URT, (2009). Tanzania Wildlife Conservation Act. (N0. 5 of 2009) of Tanzania. Dar es Salaam: Government printer.

URT, (2012). *Tanzania population and housing census.* Dar es salaam: Tanzania. Government printer.

URT, (1998a). *The Wildlife Policy of Tanzania.* Dar es Salaam: Government printer.

URT, (1998b). *The Forest Policy of Tanzania.* Dar es Salaam: Government printer.

URT, (1998c). *The Environment Policy of Tanzania.* Dar es Salaam: Tanzania. Government printer.

URT, (1999a). *The National Tourism Policy.* Dar es Salaam: Government printer.

URT, (The United republic of Tanzania). (1999b). Land Act of Tanzania. Dar es Salaam. Ministry of Land.Government printer.

Venables, A. J. *(*2016). Using Natural Resources for Development:Why Has It Proven So Difficult? *Journal of Economic Perspectives, 30* (1), 161-84.

WCPA – PARKS, (2019). *The International Journal of Protected Areas and Conservation.* Gland: IUCN.

Weber, T. (2011). *Optimal Control Theory with Applications in Economics*. Cambridge, Massachusetts. England: The MIT Press.

William, A. (2018). *Lake Tanganyika basin and Greater Mahale Ecosystem, Tanzania 30-year forest loss*. TNC Report.

World Bank, (2019). Report of The World Bank in Africa retrieved on 2oth July, 2019 from; https://www.worldbank.org/en/region/afr/overview.

APPENDICES

Appendix I: Quantitative questionnaire - English

Dear Respondent, greetings.

My name is Hiza, Allan Lukindo. I am a Ph.D. student at The Open University of Tanzania, studying the impact of terrestrial natural resources management approaches on community economic benefit. I am hereby inviting you to two hours free participation survey by responding to the questions below; Though your participation is highly valued, you can withdraw at any pointwithout any negative consequence. Any information obtained in this study will remain confidential. No one will be identified in any written reports and only group data will be presented. Here under are my contacts: Mob. Number: +255 789 179 365. Email: lukindo.hiza@gmail.com

A. Respondent's Background information

A1	Gender	Male	Female
		1	2
A2	Occupation	Formal Employment	Non – Formal employment
		1	2
A3	Age	18 to 45 years	Above 45 years
		1	2
A4	Education	Primary education	Secondary school and above
		1	2

B1. In a range of 1 to 4, where 1 = Strongly Disagree, 2 = Disagree, 3= Agree, 4= Strongly Agree; what number represents well your views and feelings in the extent of your agreement or disagreement on economic benefits gained in community from natural resources management? Tick the appropriate level number.

Code	**Item**	**In this community how do you define level of community-gained revenue and income**	**Level**

B111	1	In this community, people eat three meals per day	1	2	3	4
B112	2	Community always take/eat meal with meat, fish and eggs	1	2	3	4
B113	3	There is increase in people purchasing phones and bicycles	1	2	3	4
B114	4	In this community new houses construction is increasing	1	2	3	4
B115	5	People install electricity including solar electricity in their houses	1	2	3	4
B116	6	Houses having TV cables, antennae and dishes are increasing	1	2	3	4
B117	7	In this community people purchase new clothes frequently	1	2	3	4
B12		**What are gained community Profit**				
B121	1	In this community people opening new businesses are increasing	1	2	3	4
B122	2	The existing business are expanding and growing	1	2	3	4
B123	3	People opening a business in town are increasing	1	2	3	4
B124	4	People are taking their children to better schools	1	2	3	4
B125	5	People purchase improved seed and agro-inputs	1	2	3	4
B13		**What are level of community Cash flow**				
B131	1	Number of small businesses are increasing in this community	1	2	3	4
B132	2	Money transferring shops such as Mpesa and Tigo Pesa are increasing.	1	2	3	4
B133	3	There are close bank services such as CRDB and NMB	1	2	3	4
B134	4	Saving and lending groups are increasing in this community	1	2	3	4
B14		**What is the level of Job creation in community**				
B141	1	Youth and women are employed in nearby different sectors	1	2	3	4
B142	2	Number of youths moving to big cities has decreased	1	2	3	4
B143	3	People depending only on agriculture or livestock keeping is decreasing	1	2	3	4
B144	4	Youth-changing employers are increasing	1	2	3	4
B145	5	There is increase in people establishing small firms or business	1	2	3	4
B15		**What is the level of Wealth created in community**				
B151	1	People establish big business such as transportation vehicles	1	2	3	4
B152	2	People have big farms and cash crop plant like tree plantation	1	2	3	4
B153	3	People sell milk or eggs in bulk such as selling to companies	1	2	3	4
B154	4	Livestock keepers sell in bulk to big business and buyers	1	2	3	4
B153	5	Small industries are established in our community	1	2	3	4
B16		**How do you rate Material cost reduction in this**				

		community				
B161	1	There are many shops for construction materials such as cement	1	2	3	4
B162	2	There are many timber shops in our community.	1	2	3	4
B163	3	More houses are constructed with corrugated iron sheets	1	2	3	4
B164	4	There are many brick-selling centers	1	2	3	4
B17		**How do you rate Opportunity cost in this community**				
B171	1	We are using our forest to maximum and have enough for conservation	1	2	3	4
B172	2	We have enough land for farming and have enough for conservation	1	2	3	4
B173	3	Agriculture investors are invited and there is land for development	1	2	3	4
B174	4	Livestock keeping is having enough land, not affected by conservation	1	2	3	4
B175	5	We use enough amount of water and the rest is for downstream users	1	2	3	4
B18		**What Incentives are paid or gained to this community**				
B181	1	There are program paying for other community development works	1	2	3	4
B182	2	We receive payments for conservation	1	2	3	4
B183	3	There are conservation award and gifts	1	2	3	4
B19		**What are Ecological benefit gained by this community**				
B191	1	We have enough water from the forest.	1	2	3	4
B192	2	We have good harvest in farms that are not far from the forest.	1	2	3	4
B193	3	There is no strong wind which destroy our crops and houses.	1	2	3	4
B194	4	We enjoy cool air and staying outdoors even during mid-day time.	1	2	3	4

In a range of 1 to 4, where **1 = Strongly Disagree**, **2 = Disagree**, **3= Agree**, **4= Strongly Agree;** what number represent well your views and feelings on the following question. Are the following consumptive community natural resources management approaches to forests, land and wildlife areas produce economic benefits to the community? Pick the appropriate number

Code	Item	**How does consumptive utilization model in communal resource management produce economic benefit to community**				
B21		**What are the ways tourism hunting produce economic benefit in communal managed resources**	Level			
B211	1	Hunting blocks in our forests are active and produce returns or shares	1	2	3	4
B212	2	Percent of hunting quota, permits and licenses is paid to	1	2	3	4

		community				
B22		**How farming near protected land produce economic benefit in communal managed resources**				
B221	1	Farms near forest and wildlife areas produce more harvest	1	2	3	4
B222	2	There is enough water for farm irrigation from the forests	1	2	3	4
B223	3	Agriculture products have good farm get and nearby price	1	2	3	4
B224	4	Farm crops destroyed by wildlife are compensated	1	2	3	4
B23		**How does Meat and Fruits for food access produced economic benefit in communal managed resources**				
B231	1	Community collect enough fruits from the forest for selling.	1	2	3	4
B232	2	Community collect enough fruits from the forest for food	1	2	3	4
B233	3	Community have enough game or wildlife for meat hunting.	1	2	3	4
B24		**What are Firewood collection economic benefit in communal managed resources**				
B241	1	Community collect enough firewood from the forest	1	2	3	4
B242	2	Community make charcoal from the forest trees for sell	1	2	3	4
B243	3	Community collect enough firewood for brick making	1	2	3	4
B25		**What are Medicinal gained economic benefit in communal managed resources**				
B251	1	Community access medicinal plants and animals in the forest for sell	1	2	3	4
B252	2	Community cure and treat with medicinal plants from the forest	1	2	3	4
B26		**What are Logging and timbering gained economic benefit in communal managed resources**				
B261	1	Community sell enough timber and logs from the forest	1	2	3	4
B262	2	Community receives percent of shares from timbering permit and license.	1	2	3	4
B263	3	Community access enough building timber and poles from the forest	1	2	3	4

B3. In a range of 1 to 4, where **1 = Strongly Disagree**, **2 = Disagree**, **3= Agree**, **4= Strongly Agree;** what number represent well your views and feelings on the following question. Are the following non consumptive community natural resources management approaches applied in your general community forests, land and wildlife area produce economic benefits to the community? Circle the appropriate level number.

Code	Item	**How does non consumptive utilization model in communal resource management produce economic benefit to community**

B31		**How do you rate Tourism Photographing and Game Viewing economic benefit in communal managed resources**				
B311	1	There are enough Tourists visit forests and spend money in community.	1	2	3	4
B312	2	Percent of permit and license paid by Tourists is shared to community	1	2	3	4
B313	3	Youth lead tourists as tour guides in the community	1	2	3	4
B314	4	There are payments on community cultural performance to tourists	1	2	3	4
B32		**What are gained economic benefit from Grazing in communal managed resources in this community**				
B321	1	Community enjoy enough pasture for livestock	1	2	3	4
B322	2	Livestock which are injured by wildlife are compensated	1	2	3	4
B323	3	We have good price for livestock and its products in nearby areas	1	2	3	4
B324	4	There is enough water from forests for livestock	1	2	3	4
B33		**How does Recreation in communal managed resources produce economic benefit in this community**				
B331	1	Community member hold picknicks in the forest or wilderness.	1	2	3	4
B332	2	Community stay a day or night in forest or wilderness for refreshment.	1	2	3	4
B333	3	Community enjoy looking at the beauty of nature for pleasure	1	2	3	4
B34		**How does Transportation development in communal managed resources produce economic benefit in this community**				
B341	1	Transportation companies pay fees to community	1	2	3	4
B342	2	Community access vehicles crossing to forest or wilderness and to town	1	2	3	4
B35		**What are the Infrastructures development in communal managed resources produce economic benefit in this community**				
B351	1	Roads crossing community to forest are constructed and rehabilitated.	1	2	3	4
B352	2	Hospital and health centers are constructed and renovated in our area.	1	2	3	4
B353	3	Classrooms and student dormitories are constructed in our community	1	2	3	4
B36		**How does Hotel Services in communal managed resources produce economic benefit in this community**				
B361	1	Hotels procuring supplies from the community are increasing	1	2	3	4
B362	2	Hotels pay for community services such as school	1	2	3	4

		construction.				
B363	3	Youth are employed in the hotels	1	2	3	4
B364	4	There are increasing community food or eating centers	1	2	3	4
B37		**What are the Spiritual and ritual gained economic benefit from communal managed resources**				
B371	1	Community conduct worship or prayer in the forest.	1	2	3	4
B372	2	Community receive mystical and magical support from the forest.	1	2	3	4
B38		**How does Scientific studies produce economic benefit in communal managed resources in your community**				
B381	1	Students and nature researchers in forests pay fees to community.	1	2	3	4
B382	2	Students in our schools frequently go to the forests to learn nature	1	2	3	4

B4. In a range of 1 to 4, where **1 = Strongly Disagree**, **2 = Disagree**, **3= Agree**, **4= Strongly Agree;** what number represent well your views and feelings on the following question. Are the following Communal control and development of natural resources management approaches like wildlife corridors or community forests produce economic benefits to the community? Tick the appropriate level number.

Code	Item	**How does control and development of resources in communal managed resources benefit community economy**				
B41		**What are levels of local decision making in communal resource management that benefit economy**	Level			
B411	1	Community decide what, where or when to use land, harvest wildlife or trees	1	2	3	4
B412	2	Community decides how to use money and income from resource utilization	1	2	3	4
B42		**How do Laws and bylaws formed in communal resource management benefit community economy**				
B421	1	Community form bylaws and regulations to guide protection and utilization	1	2	3	4
B422	2	Community set amount of fines to culprit	1	2	3	4
B423	3	Community set regulations for protection, development, and utilization	1	2	3	4
B43		**What monitoring patrols in communal resource management benefit community economy**				
B431	1	Community conducts regular and ambush patrol	1	2	3	4
B432	2	There is patrol schedule for regular patrol to different sites of forest or wilderness	1	2	3	4
B433	3	Youth and patrol team such as VGS are paid on patrol or monthly basis	1	2	3	4

B44		**How does enforcement of bylaws and laws in communal resource management benefit community economy**				
B441	1	Culprit and all who break bylaws are fined without favoritism	1	2	3	4
B442	2	Fines are either deposited to community bank or used as per set guidelines	1	2	3	4
B45		**What Local infrastructure development in communal resource management benefit community economy**				
B451	1	There is a clear plan to develop infrastructures such as roads or ranger posts	1	2	3	4
B452	2	Developed infrastructures such as roads benefit another livelihood such as transport	1	2	3	4

B5. In a range of 1 to 4, where 1 = Strongly Disagree, 2 = Disagree, 3= Agree, 4= Strongly Agree; what number represent well your views and feelings on the following question. Are the following Public consumptive natural resources management approaches like forest reserves or wildlife hunting blocks produce economic benefits to the community? Pick the appropriate level number.

Code	Item	**How does consumptive utilization model in State/government resource management produce economic benefit to community**				
B51		**What are the ways tourism hunting produce economic benefit in public/government managed resources**	Level			
B511	1	Hunting blocks in our public hunting blocks are active	1	2	3	4
B512	2	Percent of hunting quota, permits and licenses is paid to community	1	2	3	4
B52		**How farming near protected land produce economic benefit in public/government managed resources**				
B521	1	Farms near public forest and wildlife areas produce more	1	2	3	4
B522	2	There is enough water for farm irrigation from the forests	1	2	3	4
B523	3	Agriculture products have good farm get and nearby price	1	2	3	4
B524	4	Farm crops destroyed by wildlife are compensated	1	2	3	4
B53		**How does Meat and Fruits for food access produced economic benefit in public/government managed resources**				
B531	1	Community collect enough fruits from the forest for selling.	1	2	3	4
B532	2	Community collect enough fruits from the forest for food	1	2	3	4
B533	3	Community have enough game or wildlife for meat hunting.	1	2	3	4
B54		**What are Firewood collection economic benefit in public/government managed resources**				
B541	1	Community collect enough firewood from the forest	1	2	3	4
B542	2	Community make charcoal from the forest trees for sell	1	2	3	4

B543	3	Community collect enough firewood for brick making	1	2	3	4
B55		**What are Medicinal gained economic benefit in public/government managed resources**				
B551	1	Community access various medicinal plants in the forest for sell	1	2	3	4
B552	2	Community cure and treat with medicinal plants from the forest	1	2	3	4
B56		**What are Logging and timbering gained economic benefit in public/government managed resources**				
B561	1	Community sell enough timber and logs from the forest	1	2	3	4
B562	2	Community receive percent of shares from timbering permit and license.	1	2	3	4
B563	3	Community access enough building timber and poles from the forest	1	2	3	4

B6. In a range of 1 to 4, where **1 = Strongly Disagree**, **2 = Disagree**, **3= Agree**, **4= Strongly Agree;** what number represent well your views and feelings on the following question. Are the following Public non consumptive natural resources management approaches like National Park, Forest Reserves and Wildlife managed areas produce economic benefits to the community? Pick the appropriate level number.

Code	Item	**How does non consumptive utilization model in state/government resource management produce economic benefit to community**				
B61		**How do you rate Tourism Photographing and Game Viewing economic benefit in public/government managed resources**				
B611	1	There are enough Tourists visit forests and spend money in community.	1	2	3	4
B612	2	Percent of permit and license paid by Tourists is shared to community	1	2	3	4
B613	3	Youth lead tourists as tour guides in the community	1	2	3	4
B614	4	There are payments on community cultural performance to tourists	1	2	3	4
B62		**What are gained economic benefit from Grazing in public/government managed resources in this community**				
B621	1	Community enjoy enough pasture for livestock	1	2	3	4
B622	2	Livestock which are injured by wildlife are compensated	1	2	3	4
B623	3	We have good price for livestock and its products in nearby areas	1	2	3	4
B624	4	There is enough water from forests for livestock	1	2	3	4
B63		**How does Recreation in public/government managed resources produce economic benefit in this community**				
B631	1	Community member hold picknicks in the forest or	1	2	3	4

		wilderness.				
B632	2	Community stay a day or night in forest or wilderness for refreshment.	1	2	3	4
B633	3	Community enjoy looking at the beauty of nature for pleasure	1	2	3	4
B64		**How does Transportation development in public/government managed resources produce economic benefit in this community**				
B641	1	Transportation companies pay fees to community	1	2	3	4
B642	2	Community access vehicles crossing to forest and to town	1	2	3	4
B65		**What are the Infrastructures development in public/government managed resources produce economic benefit in this community**				
B651	1	Roads crossing community to forest are constructed and rehabilitated.	1	2	3	4
B652	2	Hospital and health centers are constructed and renovated in our area.	1	2	3	4
B653	3	Classrooms and student dormitories are constructed in our community	1	2	3	4
B66		**How does Hotel Services in public/government managed resources produce economic benefit in this community**				
B661	1	Hotels procuring supplies from the community are increasing	1	2	3	4
B662	2	Hotels pay for community services such as school construction.	1	2	3	4
B663	3	Youth are employed in the hotels	1	2	3	4
B664	4	There are increasing community food or eating centers	1	2	3	4
B67		**What are the Spiritual and ritual gained economic benefit from public/government managed resources**				
B671	1	Community conduct worship or prayer in the forest.	1	2	3	4
B672	2	Community receive mystical and magical support from the forest.	1	2	3	4
B68		**How does Scientific studies produce economic benefit in public/government managed resources in your community**				
B681	1	Students and nature researchers in forests pay fees to community.	1	2	3	4
B682	2	Students in our schools frequently go to the forests to learn nature	1	2	3	4

B7. In a range of 1 to 4, where **1 = Strongly Disagree**, **2 = Disagree**, **3= Agree**, **4= Strongly Agree;** what number represent well your views and feelings on the following question. Are the following Public control and development of natural resources management approaches like National Park or Forest Reserve or hunting blocks or wildlife corridor produce economic benefits to the community? Pick the

appropriate level number.

Code	Item	**How does control and development of resources in state/government resource management benefit community economy**				
B71		**What are levels of government/State decision making in public/government resource management that benefit community economy**	Level			
B711	1	State decides what, where or when to use land, harvest wildlife or trees	1	2	3	4
B712	2	State decide how to use money and income from resource utilization	1	2	3	4
B72		**How does Laws and bylaws formed in public/government resource management benefit community economy**				
B721	1	State form laws and regulation to guide protection and utilization of resources	1	2	3	4
B722	2	Government set number of fines for culprit	1	2	3	4
B723	3	Government set regulations for protection, development, and utilization	1	2	3	4
B73		**What monitoring patrols in public/government resource management benefit community economy**				
B731	1	Central government conduct regular and ambush patrol	1	2	3	4
B732	2	There is patrol schedule for regular patrol to different site of forest or wilderness	1	2	3	4
B733	3	Youth and patrol team are paid on patrol or monthly basis	1	2	3	4
B74		**How does enforcement of laws in public/government resource management benefit community economy**				
B741	1	Culprit and all who break laws are fined without favoritism	1	2	3	4
B742	2	Percent of fines are returned to community and used as per set guidelines	1	2	3	4
B75		**What Local infrastructure development in public/government resource management benefit community economy**				
B751	1	There is a clear plan to develop infrastructures such as roads or ranger posts	1	2	3	4
B752	2	Developed infrastructures such as roads benefit other livelihood such as transport	1	2	3	4

Thank you so much for availing your precious time to share with me this valuable information. This marks the end of our discussion. I wish you all the best. Bye.

Appendix II: Qualitative Key Informant Interview Guideline

Dear Sir/Madam greetings.

My name is Hiza, Allan Lukindo. I am a PhD student at The Open University of Tanzania, studying the impact of terrestrial natural resources management approaches on community economic benefit. I am hereby requesting you to share with me your views and understanding of different forest natural resources management approaches and their contributions to Community Economic Benefits in this area. Any information obtained in this study will remain confidential. No one will be identified in any written reports and only group data will be presented. Here under are my contacts: Mob. Number: +255 789 179 365. Email: lukindo.hiza@gmail.com

Ask background questions on when you moved to this area, andwhat is your main economic activity and then start questions.

1. What are main practiced forestand wildlife natural resources management approaches in this area/geography? (Circle all mentioned).
    i. Communal Consumptive
    ii. Communal Non - consumptive
    iii. Public consumptive
    iv. Public Non - Consumptive
    v. Others – mention……
2. In your opinion what are the Economic benefit obtained in this community from each of those forest, land, and wildlife management approaches (ask composites of the management approaches importance on CEB) ?

i. Communal Consumptive…….

ii. Communal Non – consumptive…….…….

iii. Public consumptive……

iv. Public Non – Consumptive…….

v. Others –……..

3. In your opinion, in rank of magnitude or impact what is the forest, landor wildlife management approaches that pay more Economic benefit to community? (Assess what they value and how they value them).

   i. Communal Consumptive

   ii. Communal Non - consumptive

   iii. Public consumptive

   iv. Public Non - Consumptive

   v. Others – …….

4. How is that approach paying much to Community Economic benefit? (ask specifics) ….....

5. In your view, how is the Community Economic benefit impacted by each of the forest, land and wildlife natural resource management approaches? (ask all natural resources management approaches) .....

Thank you so much for availing your precious time to share with me this valued information. This marks the end of our discussion. I wish you all the best

Appendix III: Quantitative questionnaire in Kiswahili

A1	Jinsia	Mwanaume	Mwanamke
		1	2
A2	Kazi	Ajira rasmi	Ajira isiyo rasmi
		1	2
A3	Umri	Miaka kati ya 18 to 45	Zaidi ya miaka 45
		1	2
A4	Elimu	Elimu ya Shule ya msingi	Elimu ya sekondari na zaidi
		1	2

B1. Katika kipimo cha 1 hadi 4; ni namba ipi inawakilisha mawazo na mtizamo wako katika kukataa au kukubaliana na viwango vya **kunufaika kiuchumi kwa jamii** zitokanazo na **usimamazi na uhifadhi wa rasilimaliasili** kama vile misitu, ardhi, wanayamapori katika senetnsi zifuatzo katika viwango vya: **1 = Sikubali kabisaa, 2 = Sikubali, 3= Nakubali, 4= Nakubali kabisaa;** Chagua na bofya namba inayokuwakilisha.

Alama	**Vipengele**	**Kwa kiwango gani kipato na fedha kwa jamii hii huonekana**	**Kiwango**			
B111	1	Katika jamii hii, watu hula milo mitatu kwa siku	1	2	3	4
B112	2	Mara nyingi zaidi jamii hupata mlo wenye nyama, samaki na mayai	1	2	3	4
B113	3	Kuna ongezeko la watu wanaonunua simu na baiskeli	1	2	3	4
B114	4	Watu wanaojenga nyumba mpya katika jamii wanaongezeka	1	2	3	4
B115	5	Watu wanaingiza umeme pamoja na unmeme wa jua katika nyumba zao inaongezeka katika jamii	1	2	3	4
B116	6	Nyumba zinazotumia TV na ungo na ving'amuzi katika jamii hii inaongezeka	1	2	3	4
B117	7	Katika jamii hii, watu wanaonunua nguo mpya huongezeka	1	2	3	4
B12		**Zipi ni Faida za nufaiko la kiuchumi zinazopatikana kwa jamii yako**				
B121	1	Watu wanaoanzisha biashara mpya inaongezeka katika jamii	1	2	3	4
B12	2	Biashara zilizopo katika jamii zinaongezeka na	1	2	3	4

2		kupanuka				
B123	3	Watu kutoka katika jamii wanaoanzisha biashara mijini wanaongezeka	1	2	3	4
B124	4	Watu kwenye jamii hii wanaosomesha watoto wao kwenye shule bora kama za kulipia wanaongezeka	1	2	3	4
B125	5	Watu wanaonunua mbegu na pembejeo za kisasa katika jamii wanaongezeka	1	2	3	4
B13		**Kiwango cha mzunguuko wa fedha katika jamii hii kikoje**				
B131	1	Idadi ya biashara ndogondogo na wajasiriamali inaongezeka katika jamii	1	2	3	4
B132	2	Maduka na vibanda vya kutuma pesa kama vile Mpesa and Tigo Pesa na airtel Money vinaongezeka katika jamii	1	2	3	4
B133	3	Matawi na wakala wa benki kama vile CRDB na NMB wako karibu au kuongezeka	1	2	3	4
B134	4	Vikundi vya kuweka na kukopa vinaongezeka katika jamii	1	2	3	4
B14		**Kiwango cha upatikaji na utengenezaji wa ajira kikoje katika jamii hii**				
B141	1	Vijana na wamama katika jamii wameajiriwa katika idara au maeneo mbalimbali karibu tu na jamii yetu	1	2	3	4
B142	2	Idadi ya vijana wanaotoka katika jamii na kuhamia mijini imepungua	1	2	3	4
B143	3	Idadai ya watu wanategemea maisha na kipato kwa kilimo na ufugaji tu imepungua katika jamii	1	2	3	4
B144	4	Idadi ya vijana wanaobadilisha waajiri katika jamii imeongezeka	1	2	3	4
B145	5	Idadi ya watu wanaoanzisha biashara ndogondogo au miradi imeongezeka katika jamii	1	2	3	4
B15		**Nikiwango gani cha ukwasi au utajiri au mali kinatengezwa katika jamii hii**				
B151	1	Watu katika jamii wanaaanzisha mabiashara makubwa kama vile huduma ya usafirishaji	1	2	3	4
B152	2	Watu wameanzisha mashamba makubwa, mashamba ya mazao ya biashara kama mashamba ya miti	1	2	3	4
B153	3	Watu huuza maziwa na mayai kwa wingi kama vile kuuzia makampuni	1	2	3	4
B154	4	Wafugaji huuza mifugo kwa wingi kama vile kuuzia makampuni na wanunuzi wakubwa	1	2	3	4
B153	5	Viwanda vidogovidogo vinaazishwa katika jamii	1	2	3	4
B16		**Gharama ya malighafi katika jamii hii**				

		inatafsiriwaje				
B16 1	1	Kuna maduka mengi katika jamii yanayouza vifaa vya ujenzi kama vile sementi	1	2	3	4
B16 2	2	Kuna maduka mengi na vibanda vinavyouza mbao katika jamii	1	2	3	4
B16 3	3	Nyumba nyingi zinajengwa kwa kutumia bati la kisasa kati jamii	1	2	3	4
B16 4	4	Kuna vituo vingi vinavyouza matofali katika jamii	1	2	3	4
B17		**Ipi ni gharama kwa ajili ya fursa iliyoachwa katika jamii hii**				
B17 1	1	Jamii iinamsitu wa kutosha na inautumia msitu kwa utoshelevu na sehemu iliyobaki ndio huhifadhiwa	1	2	3	4
B17 2	2	Jamii ina ardhi ya kutosheleza mahitaji yake na sehemu iliyobaki ndio huhifadhiwa	1	2	3	4
B17 3	3	Wawekezaji wa kilimo wanakaribishwa katika jamii na kuna ardhi ya kutosha kwa maendeleo	1	2	3	4
B17 4	4	Ufugaji unapata ardhi ya kutosha na haijamezwa na uhifadhi	1	2	3	4
B17 5	5	Jamii inatumia maji kwa utoshelevu na ya ziada ndio huwaendea watumiaji wa chini	1	2	3	4
B18		**Ipi ni motisha ya kulipwa kwa ajili ya uhifadhi katika jamii hii**				
B18 1	1	Kuna programu zinalipa au kuhudumia kazi za maendeleo za jamii	1	2	3	4
B18 2	2	Jamii inalipwa kwa ajili ya kuhifadhi rasilimali	1	2	3	4
B18 3	3	Kuna Tuzo na zawadi za kiuhifdhi kwa kamii	1	2	3	4
B19		**Nii faida zipi za Kiikolojia jamii hii inazopata**				
B19 1	1	Jamii inapata maji ya kutosha kutoka katika misitu	1	2	3	4
B19 2	2	Wakulima wanavuna mazao ya kutosha kutoka kwenye mashamba yaliyokaribu na misitu	1	2	3	4
B19 3	3	Hakuna upepo mkali unaoharibu mazao	1	2	3	4
B19 4	4	Jamii inafadi hali ya hewa nzuri na kuweza hata kukaa nje hata wakati wa mchana	1	2	3	4

B2: Katika kipimo cha 1 hadi 4; ni namba ipi inawakilisha mawazo na mtizamo wako katika kukataa au kukubaliana na swali kwamba **uhifadhi wa rasilimali** kama vile misitu ya jamii, wanyamapori na ardhi **chini ya uongozi wa kijamii au kimila** na **unaoruhusu matumizi yanayoila rasilimali** unaleta **nufaiko la kiuchumi kwa jamii**, katika senetnsi zifuatzo hapa chini katika viwango vya: **1 = Sikubali kabisaa, 2 = Sikubali, 3= Nakubali, 4= Nakubali kabisaa;**

Chagua na bofya namba inayokuwakilisha.						
Alama	**Vipengele**	**Ni kwa namna gani usimamzi wa rasilimali kijamii kwa mfumo wa matumizi yanayoila rasilmali huleta nufaiko la kiuchumi kwa jamii**				
B21		**Ni kwa njia zipi utalii wakiuwindaji chini ya uhifadhi wa kijamii huzalisha nufaiko la kiuchumi kwa jamii hii**	Level			
B211	1	Vitalu vya uwindaji katika misitu na maeneo yetu vinafanyakazi na vinatuletea mapato na kutoa gawio kwa jamii	1	2	3	4
B212	2	Asilimia fulani za leseni na vibali vya uwindaji hulipwa au kurudishwa kwenye jamii	1	2	3	4
B22		**Ni kiwango gani kilimo karibu na maeneo yaliyohifadhiwa kijamii huzalisha nufaiko la kiuchumi**				
B221	1	Kilimo karibu na misitu au mapori ya wanyama huzalisha mazao zaidi	1	2	3	4
B222	2	Kuna maji na uoevu mwingi karibu na msitu iliyohidhiwa	1	2	3	4
B223	3	Mazao ya kilimo hupata bei nzuri hata yakiwa shamani	1	2	3	4
B224	4	Mazao yanayoharibiwa na wanyama hulipwa	1	2	3	4
B23		**Ni kiwango gani upatikanaji wa nyama na matunda katika misitu inayohifadhiwa kijamii huleta nufaiko la kiuchumi**				
B231	1	Jamii hukusanya matunda ya kutosha kwa ajili ya kuuza kutoka katika misitu ya kijamii	1	2	3	4
B232	2	Jamii hukusanya matunda ya kutosha kwa ajili ya chakula kutoka katika misitu ya kijamii	1	2	3	4
B233	3	Jamii inapata nyama pori ya kutosha kwa kitoweo	1	2	3	4
B24		**Ni nufaiko la kiuchumi katika jamii hii kwa uokotaji kuni kutoka katika misitu iliyohifadhiwa kijamii**				
B241	1	Jamii hukusanay kuni za kutosha kwa matumizi kutoka katika misitu ya kijamii	1	2	3	4
B242	2	Jamii huchom mkaa kutoka katika misitu ya inayohifadhiwa kijamii kwa ajili ya kuuzal	1	2	3	4
B24	3	Jamii huokota kuni nyingi kwa ajili ya	1	2	3	4

3		kutengeneza matofali ya kuuza				
B25		**Ni faida zipi za dawa nakimatibabu zinazopatikana katika misitu inayohifadhiwa kijamii**				
B25 1	1	Jamii hujipatia miti ya dawa (miti shamba) na wanyama dawa katika misitu inayohifadhiwa kijamii	1	2	3	4
B25 2	2	Jamii wanatibiwa na kugangwa kwa mitishamba inayopatikana katika misitu inayohifadhiwa kijamii	1	2	3	4
B26		**Ni faida zipi za kiuchumi za uchanaji mbao na ukataji magogo katika misitu inayohifadhiwa kijamii**				
B26 1	1	Jamii inauza mbao na magogo ya kutoshwa kutoka katika misitu ya inayohifahiwa kijamii	1	2	3	4
B26 2	2	Jamii inapokea asilimia ya fedha zitokanazo na vibali na leseni za uchanaji mbao na uuzaji magogo kutoka katika misitu iliyohifadhiwa kijamii	1	2	3	4
B26 3	3	Jamii hupata mbao na miti ya kujengea ya kutosha kutoka katika misitu iliyohifadhiwa kijamii	1	2	3	4
B3: Katika kipimo cha 1 hadi 4; ni namba ipi inawakilisha mawazo na mtizamo wako katika kukataa au kukubaliana na swali kwamba **uhifadhi wa rasilimali** kama vile misitu, wanyamapori na ardhi **chini ya uongozi wa kijamii** au kimila **na unaoruhusu matumizi yasiyoila rasilimali** unaleta **nufaiko la kiuchumi kwa jamii**, katika senetnsi zifuatzo hapa chini katika viwango vya: **1 = Sikubali kabisaa, 2 = Sikubali, 3= Nakubali, 4= Nakubali kabisaa;** Chagua na bofya namba inayokuwakilisha.							
Alama	**Vipengele**	**Ni kwa namna gani usimamzi wa rasilimali kijamii kwa mfumo wa matumizi yasiyoila rasilmali huleta nufaiko la kiuchumi kwa jami**				
B31		**Ni kwa namna gani utalii wa picha na kutazama wanyama katika uhifadhi wa kijamii unavyochangia faida ya kiuchumi katika jamii**				
B31 1	1	Kuna watalii wengi wanaotembelea misitu na maporii ya kijamii na kufanya matumizi katika jamii	1	2	3	4
B31 2	2	Asilimia ya fadha inayolipwa na watalii kwa ajili ya vibali na leseni katika misitu na mapori ya jamii inabaki katika jamii	1	2	3	4
B31 3	3	Vijana wanawaongoza watalii na kulipwa katika jamii	1	2	3	4
B31 4	4	Watu wanaocheza ngoma za kitamaduni na kuonyesha maigizo wanalipwa na watalii au wageni	1	2	3	4

B32		**Ni faida gani za kiuchumi za ufugaji katika rasilmali zinazohifadhiwa na jamii**				
B321	1	Wafugaji wanapata malisho ya kutosha katika maeneo yaliyohifadhiwa na jamii	1	2	3	4
B322	2	Mifugo inayojeruhiwa au kurarurіwa na wanayamapori inafidiwa katika maeneo yanayohifadhiwa na jamii	1	2	3	4
B323	3	Mifugo inapata bei nzuri na soko la karibu	1	2	3	4
B324	4	Kunapatikana maji ya kutosha kwa mifugo kutoka katika misitu na mapori yalihifadhiwa na jamii	1	2	3	4
B33		**Ni kwa namna gani kuburudika, mapumziko na kujiriwaza katika hifadhi za kijamii huleta nufaiko la kiuchumi katika jamii**				
B331	1	Jamii hufanya sherehe na starehe katika misitu na mapori yalihifadhiwa kijamii	1	2	3	4
B332	2	Jamii hushinda au hulala walao kwa siku moja katika misitu au mapori ya kijamii ili kujipumzisha	1	2	3	4
B333	3	Jamii hufurahia kuangalia uzuri na mvuto wa rasilmali	1	2	3	4
B34		**Ni kwa namna gani uendelezaji wa nyanja ya usafirishaji katika raslimali zinazohifadhiwa kijamii huleta nufaiko la uchumi katika jamii**				
B341	1	Makampuni ya usafirishaji hulipa ada na viwango kwa jamii	1	2	3	4
B342	2	Jamii inapata fursa ya kiusafiri kutumia magari yanayokwenda kwenye mapori au misitu yao	1	2	3	4
B35		**Je, ni uendelezaji upi wa miundombinu katika hifadhi za kijamii unaoleta nufaiko la kiuchumi kwa jamii**				
B351	1	Barabara zinazokatiza kwenye jamii kuelekea kwenye hifadhi za jamii zinajengwa na kukarabatiwa	1	2	3	4
B352	2	Hospitali na vituo vya afya vinakarabatiwa na kujengwa kutokana na hifadhi za jamii katika jamii	1	2	3	4
B353	3	Madarasa na mabweni yawanafunzi yanajengwa kutokana na hifadhi za jamiikatika jamii yetu	1	2	3	4
B36		**Ni kwa namna gani huduma za kihotelia katika uhifadhi wa kijamii huleta faida ya kiuchumi kwenye jamii**				
B361	1	Hoteli zilizoko kwenye hifadhi za kijamii hununua vitu kutoka kwa jamii	1	2	3	4
B362	2	Mahoteli kwenye hifadhi za kijamiii yanalipia jamii ujenzi wa mashule na vituo vya afya	1	2	3	4

B363	3	Vijana wanaajiriwa kwenye hoteli zilizoko kwenye hifadhi za kijamii	1	2	3	4
B364	4	Maeneo ya kupata huduma za chakula yameongezeka katika jamii	1	2	3	4
B37		**Ni huduma zipi za kiroho, kiimani na kimila kwenye hifadhi za kijamii zinaleta nufaiko la kiuchumi kwenye jamii**				
B371	1	Jamii inafanya ibada, maombi au matambiko kwenye misitu na mapori ya kijamii	1	2	3	4
B372	2	Jamii hupokea miujiza na mafaniko ya nguvu zisizoonekana kutoka kwenye misitu na mapori ya kijamii	1	2	3	4
B38		**Ni kwa namna gani mafunzo na tafiti za kisayansi katika hifadhi za kijamii huleta faida ya kiuchumi kwenye jamii**				
B381	1	Wanafunzi na watafiti katika misitu na hifadhi za jamii wanalipa ada na tozo kwa jamii	1	2	3	4
B382	2	Wanafunzi katika shule zetu wanakwenda mara kwa mara kujifunza kwenye hifadhi za kijamii	1	2	3	4

B4: Katika kipimo cha 1 hadi 4; ni namba ipi inawakilisha mawazo na mtizamo wako katika kukataa au kukubaliana na swali kwamba **usimamizi, uangalizi na uendelezajii wa rasilimali** kama vile misitu ya jamii, wanyamapori, mapitio ya wanyamapori na ardhi kwa **chini ya uongozi wa kimila au kjamii** unaleta **nufaiko la kiuchumi kwa jamii**, katika senetnsi zifuatzo hapa chini katika viwango vya: 1 = Sikubali kabisaa, 2 = Sikubali, 3= Nakubali, 4= Nakubali kabisaa; Chagua na bofya namba inayokuwakilisha.

Alama	**Vipengele**	**Ni kwa namna gani usimamizi, uangalizi na uendelezajii wa rasilimali katika hifadhi za kijamii huleta nufaiko la uchumi kwenye jamii**				
B41		**Jamii inahusika kwa kiwango gani katika ufanyaji wa maamuzi ya kiusimamizi na kiutawala juua ya uhifadhi wa kijamii uletao nufaiko la kiuchumi kwa jamii**	Level			
B411	1	Jamii inafanya maamuzi juu ya nini, wapi na lini kutumia ardhi, kuvuna wanyama au miti kwenye hifadhi za jamii.	1	2	3	4
B412	2	Jamii inafanya maamuzi juu ya namna ya kutumia fedha na mapato ya uhifahdi wa raslmali	1	2	3	4
B42		**Ni kwa namna gani sheria na sheria ndogondogo zinazotungwa kwa ajili ya uhifadhi wa kijamii zinanufaisha uchumi wa kijamii**				
B421	1	Jamii inatunga sheria ndogondogo zinaoongoza namna ya kutumia rasilimali kwa faida ya jamii	1	2	3	4
B422	2	Jamii inaweka kiwango cha adhabu na tozo kwa wahalifu	1	2	3	4

B423	3	Jamii inatunga miongozo ya namna ya kulinda, kutunza, kuendeleza na kutumia raslimali katika hifadhi za kijamii	1	2	3	4
B43		**Ni doria na ufuatilaji gani katika hifadhi za kijamii unanufaisha uchumi wa jamii**				
B431	1	Jamii inafanya doria zilizopangwa na za dharura katika hifadhi za kijamii	1	2	3	4
B432	2	Jamii inaratiba ya kufdanya doria sehemu mbalimbali za hifadhi ya jamiii	1	2	3	4
B433	3	Vijana na askari wa doria wanalipwa posho kwa doria kwenye hifadhi za jamii	1	2	3	4
B44		**Ni kwa jinsi gani utekelezaji wa sheria na miongozo katika hifadhi za jamii unanufaisha jamii kiuchumi**				
B441	1	Wahalifu na wavunja sheria katika hifadhi za jamii wanatozwa adhabu bila upendeleo	1	2	3	4
B442	2	Adhabu zinazotozwa wahalifu katika hifadhi za jamii zinawekwa benki katika akauti za jamii au kutumiwa sawa na zilivyopangiwa	1	2	3	4
B45		**Kwa namna gani uendelezaji wa miundombinu katika hifadhi za jamii unanufaisha jamii kiuchumi**				
B451	1	Kuna mpango kamaili wa uendelezaji miundombinu katika hifadhi za jamii kama vile barabara na vituo vya askari (ranger post)	1	2	3	4
B452	2	Miundombinu iliyoendelezwa kama vile barabara katika hifadhi za jamii husaidia shughuli zingine za kimaisha kama vile usafirishaji	1	2	3	4
B5: Katika kipimo cha 1 hadi 4; ni namba ipi inawakilisha mawazo na mtizamo wako katika kukataa au kukubaliana na swali kwamba **uhifadhi wa rasilimali chini ya usimamizi wa serikali** kama vile misitu wa akiba (Forest reserve) au kitalu cha uwindaji wanyamapori **unaoruhusu matumizi yanayoila rasilimal**i unaleta **nufaiko lakiuchumi kwa jamii,** katika senetnsi zifuatzo hapa chini katika viwango vya: **1 = Sikubali kabisaa, 2 = Sikubali, 3= Nakubali, 4= Nakubali kabisaa;** Chagua na bofya namba inayokuwakilisha.							
Alama	**Vipengele**	**Ni kwa namna gani usimamzi wa rasilimali chini ya serkali kwa mfumo wa matumizi yanayoila rasilmali huleta nufaiko la kiuchumi kwa jami**				
B51		**Ni kwa njia zipi utalii wakiuwindaji chini ya uhifadhi wa kiserikali huzalisha nufaiko la kiuchumi kwa jamii chini**	Level			
B511	1	Vitalu vya uwindaji katika misitu na maeneo yetu vinafanyakazi na vinatuletea mapato na kutoa gawio kwa jamii	1	2	3	4
B512	2	Asilimia fulani za leseni na vibali vya uwindaji hulipwa au kurudishwa kwenye jamii	1	2	3	4

B52		**Ni kiwango gani kilimo karibu na maeneo yaliyohifadhiwa na serkali huzalisha faida ya kiuchumi**				
B52 1	1	Kilimo karibu na misitu au mapori ya wanyama huzalisha mazao zaidi	1	2	3	4
B52 2	2	Kuna maji na uoevu mwingi karibu na msitu iliyohidhiwa	1	2	3	4
B52 3	3	Mazao ya kilimo hupata bei nzuri hata yakiwa shamani	1	2	3	4
B52 4	4	Mazao yanayoharibiwa na wanyama hulipwa	1	2	3	4
B53		**Ni kiwango gani upatikanaji wa nyama na matunda katika misitu inayohifadhiwa kiserkali huleta nufaiko la kiuchumi**				
B53 1	1	Jamii hukusanya matunda ya kutosha kwa ajili ya kuuza kutoka katika misitu ya serklali	1	2	3	4
B53 2	2	Jamii hukusanya matunda ya kutosha kwa ajili ya chakula kutoka katika misitu ya kiserkali	1	2	3	4
B53 3	3	Jamii inapata nyama pori ya kutosha kwa kitoweo	1	2	3	4
B54		**Ni faida zipi za kiuchumi za uokotaji kuni kutoka katika misitu iliyohifadhiwa kiserkali**				
B54 1	1	Jamii hukusanay kuni za kutosha kwa matumizi kutoka katika misitu ya kiserkali	1	2	3	4
B54 2	2	Jamii huchom mkaa kutoka katika misitu ya inayohifadhiwa kiserkali kwa ajili ya kuuzal	1	2	3	4
B54 3	3	Jamii huokota kuni nyingi kutoka katika misitu ya kiserkalikwa ajili ya kutengeneza matofali ya kuuza	1	2	3	4
B55		**Ni faida zipi za dawa nakimatibabu zinazopatikana katika misitu inayohifadhiwa kiserkali**				
B55 1	1	Jamii hujipatia miti ya dawa (miti shamba) na wanyama dawa katika misitu inayohifadhiwa kiserkali	1	2	3	4
B55 2	2	Jamii wanatibiwa na kugangwa kwa mitishamba inayopatikana katika misitu inayohifadhiwa kiserkali	1	2	3	4
B56		**Ni faida zipi za kiuchumi za uchanaji mbao na ukataji magogo katika misitu inayohifadhiwa kiserkali**				
B56 1	1	Jamii inauza mbao na magogo ya kutoshwa kutoka katika misitu ya inayohifahiwa kiserkali	1	2	3	4

B562	2	Jamii inapokea asilimia ya fedha zitokanazo na vibali na leseni za uchanaji mbao na uuzaji magogo kutoka katika misitu iliyohifadhiwa kiserkali	1	2	3	4
B563	3	Jamii hupata mbao na miti ya kujengea ya kutosha kutoka katika misitu iliyohifadhiwa kiserkali	1	2	3	4

.**B6:** Katika kipimo cha 1 hadi 4; ni namba ipi inawakilisha mawazo na mtizamo wako katika kukataa au kukubaliana na swali kwamba **uhifadhi wa rasilimali chini ya usimamizi wa serikali** kama vile Hifadhi za Taifa (National Park), misitu wa akiba(Forest reserve)au kitalu cha uwindaji wanyamapori au pitio la wanyamapori **unaoruhusu matumizi yasiyoila rasilimali** unaleta **nufaiko la kiuchumi kwa jamii,** katika senetnsi zifuatzo hapa chini katika viwango vya: **1 = Sikubali kabisaa, 2 = Sikubali, 3= Nakubali, 4= Nakubali kabisaa;** Chagua na bofya namba inayokuwakilisha.

Alama	**Vipengele**	**Ni kwa namna gani usimamzi wa rasilimali chini ya serkali kwa mfumo wa matumizi yasiyoila rasilmali huleta faida ya kiuchumi kwa jami**				
B61		**Ni kwa namna gani utalii wa picha na kutazama wanyama katika uhifadhi wa kiserkali unavyochangia nufaiko la kiuchumi katika jamii**				
B611	1	Kuna watalii wengi wanaotembelea misitu na mapori ya serkali na kufanya matumizi katika jamii	1	2	3	4
B612	2	Asilimia ya fadha inayolipwa na watalii kwa ajili ya vibali na leseni katika misitu na mapori ya serkalii inabaki katika jamii	1	2	3	4
B613	3	Vijana wanawaongoza watalii na kulipwa katika jamii	1	2	3	4
B614	4	Watu wanaocheza ngoma za kitamaduni na kuonyesha maigizo wanalipwa na watalii au wageni	1	2	3	4
B62		**Ni faida gani za kiuchumi za ufugaji katika rasilmali zinazohifadhiwa na serkali**				
B621	1	Wafugaji wanapata malisho ya kutosha katika maeneo yaliyohifadhiwa na serkali	1	2	3	4
B622	2	Mifugo inayojeruhiwa au kurariuriwa na wanayamapori inafidiwa katika maeneo yanayohifadhiwa na serkali	1	2	3	4
B623	3	Mifugo inapata bei nzuri na soko la karibu	1	2	3	4
B624	4	Kunapatikana maji ya kutosha kwa mifugo kutoka katika misitu na mapori yalihifadhiwa na serkali	1	2	3	4
B63		**Ni kwa namna gani kuburudika, mapumziko na kujiriwaza katika hifadhi za kiserkali huleta nufaiko la kiuchumi katika jamii**				

B631	1	Jamii hufanya sherehe na starehe katika misitu na mapori yalihifadhiwa kiserkali	1	2	3	4
B632	2	Jamii hushinda au hulala walao kwa siku moja katika misitu au mapori ya kijserkali ili kujipumzisha	1	2	3	4
B633	3	Jamii hufurahia kuangalia uzuri na mvuto wa rasilmali	1	2	3	4
B64		**Ni kwa namna gani uendelezaji wa nyanja ya usafirishaji katika raslimali zinazohifadhiwa kiserkalii huleta nufaiko la uchumi katika jamii**				
B641	1	Makampuni ya usafirishaji hulipa ada na viwango kwa jamii	1	2	3	4
B642	2	Jamii inapata fursa ya kiusafiri kutumia magari yanayokwenda kwenye mapori au misitu ya kiserkali	1	2	3	4
B65		**Je, ni uendelezaji upi wa miundombinu katika hifadhi za kiserkali unaoleta nufaiko la kiuchumi kwa jamii**				
B651	1	Barabara zinazokatiza kwenye jamii kuelekea kwenye hifadhi za Serkali zinajengwa na kukarabatiwa	1	2	3	4
B652	2	Hospitali na vituo vya afya vinakarabatiwa na kujengwa katika jamii kutokana na hifadhi za serkali	1	2	3	4
B653	3	Madarasa na mabweni yawanafunzi yanajengwa katika jamii kutokana na hifadhi za serkali	1	2	3	4
B66		**Ni kwa namna gani huduma za kihotelia katika uhifadhi wa kiserkalii huleta nufaiko la kiuchumi kwenye jamii**				
B661	1	Hoteli zilizoko kwenye hifadhi za kiserkali hununua vitu kutoka kwa jamii	1	2	3	4
B662	2	Mahoteli kwenye hifadhi za kiserkali yanalipia jamii ujenzi wa mashule na vituo vya afya	1	2	3	4
B663	3	Vijana wanaajiriwa kwenye hoteli zilizoko kwenye hifadhi za kiserkali	1	2	3	4
B664	4	Maeneo ya kupata huduma za chakula yameongezeka katika jamii	1	2	3	4
B67		**Ni huduma zipi za kiroho, kiimani na kimila kwenye hifadhi za kijserkali zinaleta nufaiko la kiuchumi kwenye jamii**				
B671	1	Jamii inafanya ibada, maombi au matambiko kwenye misitu na mapori ya kiserkali	1	2	3	4
B672	2	Jamii hupokea miujiza na mafaniko ya nguvu zisizoonekana kutoka kwenye misitu na mapori ya kiserkali	1	2	3	4

B68		**Ni kwa namna gani mafunzo na tafiti za kisayansi katika hifadhi za kiserkali huleta nufaiko la kiuchumi kwenye jamii**				
B681	1	Wanafunzi na watafiti katika misitu na hifadhi za serkali wanalipa ada na tozo kwa jamii	1	2	3	4
B682	2	Wanafunzi katika shule zetu wanakwenda mara kwa mara kujifunza kwenye hifadhi za kiserkali	1	2	3	4

B7: Katika kipimo cha 1 hadi 4; ni namba ipi inawakilisha mawazo na mtizamo wako katika kukataa au kukubaliana na swali kwamba **usimamizi, uangalizi na uendelezajii wa rasilimali** kama vile Hifadhi za Taifa (National Parks), misitu ya akiba (Forest Reserve), Vitalu vya uwindaji wanyamapori, mapitio ya wanyamapori na ardhi **chini ya usimamizi wa Serkali** unaleta **nufaiko la kiuchumi kwa jamii**, katika senetnsi zifuatzo hapa chini katika viwango vya: 1 = Sikubali kabisaa, 2 = Sikubali, 3= Nakubali, 4= Nakubali kabisaa; Chagua na bofya namba inayokuwakilisha.

Alama	**Vipengele**	**Ni kwa namna gani usimamizi, uangalizi na uendelezajii wa rasilimali katika hifadhi za kiserkali huleta faida ya uchumi kwenye jamii**				
B71		**Serkali inahusika kwa kiwango gani katika ufanyaji wa maamuzi ya kiusimamizi na kiutawala juua ya uhifadhi wa kiserkalii uletao nufaiko la kiuchumi kwa jamii**	Level			
B711	1	Serkali ndio inafanya maamuzi juu ya nini, wapi na lini kutumia ardhi, kuvuna wanyama au miti kwenye hifadhi za jamii.	1	2	3	4
B712	2	Serkali inafanya maamuzi juu ya namna ya kutumia fedha na mapato ya uhifahdi wa raslmali	1	2	3	4
B72		**Ni kwa namna gani sheria na sheria zinazotungwa kwa ajili ya uhifadhi wa kiserkali zinanufaisha uchumi wa kijamii**				
B721	1	Serkali inatunga sheria zinaoongoza namna ya kutumia rasilimali kwa faida ya jamii	1	2	3	4
B722	2	Serkali inaweka kiwango cha adhabu na tozo kwa wahalifu	1	2	3	4
B723	3	Serkali inatunga miongozo ya namna ya kulinda, kutunza, kuendeleza na kutumia raslimali katika hifadhi za kiserkali	1	2	3	4
B73		**Ni doria na ufuatilaji gani katika hifadhi za kiserkali unanufaisha uchumi wa jamii**				
B731	1	Serkali inafanya doria zilizopangwa na za dharura katika hifadhi za Serkali	1	2	3	4
B732	2	Serkali inaratiba ya kufanya doria sehemu mbalimbali za hifadhi ya Serkali	1	2	3	4
B733	3	Vijana na askari wa doria wanalipwa posho kwa doria kwenye hifadhi za serkali	1	2	3	4

B74		**Ni kwa jinsi gani utekelezaji wa sheria na miongozo katika hifadhi za serikali unanufaisha jamii kiuchumi**				
B741	1	Wahalifu na wavunja sheria katika hifadhi za serikali wanatozwa adhabu bila upendeleo	1	2	3	4
B742	2	Adhabu zinazotozwa wahalifu katika hifadhi za serikali zinawekwa benki katika akauti za serikali au kutumiwa sawa na zilivyopangiwa	1	2	3	4
B75		**Kwa namna gani uendelezaji wa miundombinu katika hifadhi za serikali unanufaisha jamii kiuchumi**				
B751	1	Kuna mpango kamaili wa uendelezaji miundombinu katika hifadhi za serikali kama vile barabara na vituo vya askari (ranger post)	1	2	3	4
B752	2	Miundombinu iliyoendelezwa kama vile barabara katika hifadhi za serkali husaidia shughuli zingine za kimaisha kama vile usafirishaji	1	2	3	4

Appendix IV: Katavi region five years gross domestic product

Gross Domestic Product at Current Prices - Katavi Region

Tshs. Million

Economic Activity	2014	2015	2016	2017	2018
Agriculture	**361,117**	**497,593**	**622,343**	**827,579**	**890,949**
Crops	311,501	439,109	527,370	671,676	706,447
Livestock	17,782	23,896	48,514	67,764	88,823
Forestry and Hunting	28,695	28,747	42,235	83,618	90,115
Fishing	3,138	5,840	4,224	4,521	5,564
Mining and Quarrying	4,024	5,474	7,514	7,053	8,724
TOTAL GDP	**899,620**	**1,132,135**	**1,383,376**	**1,613,656**	**1,732,408**

Percentage Share of Economic Activity to Gross Domestic Product at Current Prices - Katavi Region

Percent

Economic Activity	2014	2015	2016	2017	2018
Agriculture	**40.1**	**44.0**	**45.0**	**51.3**	**51.4**
Crops	34.6	38.8	38.1	41.6	40.8
Livestock	2.0	2.1	3.5	4.2	5.1
Forestry and Hunting	3.2	2.5	3.1	5.2	5.2
Fishing	0.3	0.5	0.3	0.3	0.3
Mining and Quarrying	0.4	0.5	0.5	0.4	0.5
TOTAL GDP	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Appendix V: Research letters

THE OPEN UNIVERSITY OF TANZANIA

DIRECTORATE OF POSTGRADUATE STUDIES

P.O. Box 23409
Dar es Salaam, Tanzania
http://www.openuniversity.ac.tz

Tel: 255-22-2668992/2668445
ext.2101
Fax: 255-22-2668759
E-mail: dpgs@out.ac.tz

Our Ref: PG201800392

13th September 2021

Region Administrative Secretary (RAS),

Kigoma Region,

P.O.Box.125,

KIGOMA.

RE: RESEARCH CLEARANCE

The Open University of Tanzania was established by an Act of Parliament No. 17 of 1992, which became operational on the 1st March 1993 by public notice No.55 in the official Gazette. The Act was however replaced by the Open University of Tanzania Charter of 2005, which became operational on 1st January 2007.In line with the Charter, the Open University of Tanzania mission is to generate and apply knowledge through research.

To facilitate and to simplify research process therefore, the act empowers the Vice Chancellor of the Open University of Tanzania to issue research clearance, on behalf of the Government of Tanzania and Tanzania Commission for Science and Technology, to both its staff and students who are doing research in Tanzania. With this brief background, the purpose of this letter is to introduce to you **Mr. HIZA, Allan Lukindo,Reg No: PG201800392** pursuing **Doctor of Philosophy (PhD).** We here by grant this clearance to conduct a research titled **"Impact of Terrestrial Natural Resources Management Approaches on Community Economic Benefit in Western Tanzania".** He will collect his data at your area from 13th September 2021 to 30th March 2022.

In case you need any further information, kindly do not hesitate to contact the Deputy Vice Chancellor (Academic) of the Open University of Tanzania, P.O.Box 23409, Dar es Salaam.Tel: 022-2-2668820.We lastly thank you in advance for your assumed cooperation and facilitation of this research academic activity.

Yours,
THE OPEN UNIVERSITY OF TANZANIA

Prof. Magreth S.Bushesha
DIRECTOR OF POSTGRADUATE STUDIES.

THE OPEN UNIVERSITY OF TANZANIA

DIRECTORATE OF POSTGRADUATE STUDIES

P.O. Box 23409
Dar es Salaam, Tanzania
http://www.openuniversity.ac.tz

Tel: 255-22-2668992/2668445
ext.2101
Fax: 255-22-2668759
E-mail: dpgs@out.ac.tz

Our Ref: PG201800392

13th September 2021

Region Administrative Secretary (RAS),

Katavi Region,

P.O.Box.235,

KATAVI.

RE: RESEARCH CLEARANCE

The Open University of Tanzania was established by an Act of Parliament No. 17 of 1992, which became operational on the 1st March 1993 by public notice No.55 in the official Gazette. The Act was however replaced by the Open University of Tanzania Charter of 2005, which became operational on 1st January 2007.In line with the Charter, the Open University of Tanzania mission is to generate and apply knowledge through research.

To facilitate and to simplify research process therefore, the act empowers the Vice Chancellor of the Open University of Tanzania to issue research clearance, on behalf of the Government of Tanzania and Tanzania Commission for Science and Technology, to both its staff and students who are doing research in Tanzania. With this brief background, the purpose of this letter is to introduce to you **Mr. HIZA, Allan Lukindo,Reg No: PG201800392** pursuing **Doctor of Philosophy (PhD).** We here by grant this clearance to conduct a research titled **"Impact of Terrestrial Natural Resources Management Approaches on Community Economic Benefit in Western Tanzania".** He will collect his data at your area from 13th September 2021 to 30th March 2022.

In case you need any further information, kindly do not hesitate to contact the Deputy Vice Chancellor (Academic) of the Open University of Tanzania, P.O.Box 23409, Dar es Salaam.Tel: 022-2-2668820.We lastly thank you in advance for your assumed cooperation and facilitation of this research academic activity.

Yours,
THE OPEN UNIVERSITY OF TANZANIA

Prof. Magreth S.Bushesha
DIRECTOR OF POSTGRADUATE STUDIES.

JAMHURI YA MUUNGANO WA TANZANIA
OFISI YA RAIS
TAWALA ZA MIKOA NA SERIKALI ZA MITAA

MKOA WA KIGOMA:
Tel: "REGCOM"
Simu: 028-280-2330
Fax: 0282802330
Unapojibu tafadhali taja:

Ofisi ya Mkuu wa Mkoa,
S.L.P. 125,
KIGOMA.

21 Septemba, 2021.

Kumb.Na. DA.73/274/02 "L"/199

Katibu Tawala wa Wilaya,
UVINZA.

YAH: BW. HIZA, ALLAN LUKINDO KUPEWA KIBALI CHA KUFANYA UTAFITI

Tafadhali husika na mada tajwa hapo juu.

2. Tumepokea barua yenye Kumb. Na. PG20100392 ya tarehe 13 Septemba, 2021 kutoka Chuo Kikuu Huria cha Tanzania ikiomba kibali cha **Bw. HIZA, Allan Lukindo** kufanya utafiti kuhusiana na **"Usimamizi wa Maliasili na Faida zake Kiuchumi"**. Bw. HIZA, A. Lukindo ni Mwanafunzi wa Shahada ya Uzamivu katika Chuo hicho.

3. Kibali kimetolewa kwa mtajwa kukusanya taarifa zinazohusiana na dhima ya utafiti wake katika Mkoa wa Kigoma. Bw. HIZA atakutana na Viongozi, Watendaji wa Taasisi za Umma na wadau wengine katika Wilaya ya Uvinza kulingana na mahitaji ya utafiti wake. Kibali kimetolewa kuanzia tarehe ya barua hii hadi 30 Machi, 2022. Tafadhali mpatie ushirikiano atakapokuwa kwenye Wilaya yako.

Nakushukuru kwa ushirikiano wako.

Jonas B. Joas
Kny: Katibu Tawala wa Mkoa
KIGOMA

Kny: KATIBU TAWALA WA MKOA
KIGOMA

Nakala: Mkurugenzi Mtendaji Wilaya,
S.L.P. 12,
UVINZA.

Bw. HIZA, Allan Lukindo,
S.L.P. 23409,
DAR ES SALAAM.

JAMHURI YA MUUNGANO WA TANZANIA
OFISI YA RAIS
TAWALA ZA MIKOA NA SERIKALI ZA MITAA

MKOA WA KATAVI
Anwani ya Simu: ***"REGCOM"***
SIMU:(025)-2957103,
FAX: (025)-2957108,
Barua pepe:
ras.katavi@tamisemi.go.tz

OFISI YA MKUU WA MKOA,
S. L. P 235,
MPANDA - KATAVI.

Unapojibu tafadhali taja:-
Kumb. Na. AB.309/366/01"C"/30 01/10/2021

Mkurugenzi Mtendaji,
Halmashauri ya Wilaya ya Tanganyika,
S.L.P. 01,
Tanganyika.

Yah: UTAFITI KUHUSU "IMPACT OF TERRESTRIAL NATURAL RESOURCE MANAGEMENT APPROCHES ON COMMUNITY ECONOMIC BENEFIT IN WESTERN TANZANIA"- BWANA HIZA ALLAN LUKINDO.

Tafadhali husika na mada tajwa hapo juu.

2. Ofisi imepokea barua kutoka Chuo Kikuu Huria cha Tanzania yenye Kumb. Na. PG201800392 ya tarehe 13/09/2021 ambayo imetoa kibali cha utafiti kwa Bwana Hiza Allan Lukindo ambaye anasoma Chuoni hapo kwa ajili ya kupata Udaktari wa Philosofi **(Doctor of Phylosophy (Phd)).**

3. Ili kukamilisha utafiti tajwa Bwana Hiza Allan amepewa muda wa miezi saba kuanzia tarehe **13 Septemba, 2021** hadi tarehe **30 Machi, 2022** kwa ajili ya kukusanya takwimu katika eneo la magharibi ya Tanzania.

4. Kwa barua hii unaombwa kumpokea na kumpatia msaada anaoweza kuhitaji katika utafiti huo. Aidha, endapo utahitaji ufafanuzi wowote juu yake usisite kuwasiliana na Makao Makuu ya Chuo upande wa Taaluma kupitia anuani S.L.P 22409 Dar es Salaam kupitia ofisi hii au simu 022-2-2668820.

5. Natanguliza shukrani kwa ushirikiano.

Kny. KATIBU TAWALA MKOA
KATAVI

C. Joseph
Kny: KATIBU TAWALA WA MKOA

Nakala: Mr. Hiza Allan Lukindo

" Makamu Mkuu wa Chuo (Taaluma)
Chuo Kikuu Huria Tanzania,
S.L.P. 23409,
Dar es Salaam.

" Katibu Tawala wa Wilaya,
S.L.P. 103,
Tanganyika.

Appendex VI: Traditional ritual and spiritual worshiping sites

Indigenous Tongwe tribe conduct ritual and traditional worships at this site in Mahale Mountain forests. They believe they receive mirracles when they worship here. The port is estimated to more than 80 years old.