

**ANALYSIS OF ECONOMIC DETERMINANTS FOR HOUSEHOLDS
INVOLVEMENT IN FISHING FOR LIVELIHOODS IN COASTAL VILLAGES
OF BAGAMOYO DISTRICT, TANZANIA**

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**A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN
ENVIRONMENTAL AND NATURAL RESOURCE ECONOMICS OF SOKOINE
UNIVERSITY OF AGRICULTURE. MOROGORO, TANZANIA.**

ABSTRACT

This study was undertaken to analyse economic determinants for households involvement in fishing for livelihoods in coastal villages of Bagamoyo District. Specifically, trend in the number of fishers for ten years in coastal villages were determined, factors influencing household decision to be involved in fishing were examined and household income structure was analysed. Three villages were randomly selected and thirty households were randomly selected from each village. Primary data were collected through questionnaire, checklist and Focused Group Discussion. Qualitative data were analysed using content analysis while quantitative data were analysed by descriptive statistics, binary logistic model and ANOVA. Results indicate the trend on the number of fishers was increasing over the years. Binary logistic model result reveal significant factors that were negatively influencing households decision to be involved in fishing at $p < 0.05$ are alternative income generating activities, access to credit, land size, organisation participation and education while household size had positive influence. Perceived influential factors were family business, available fish market, short time of earning income, small initial capital and free access of water bodies. Furthermore, results show that 72.2% of the households' were involved in fishing. Results showed that fishing was the major source of income to household as it contributes (45.3%) to overall households income which is greater than income from other sources, which are wage labour agriculture and petty business. Overall annual average income was 1 065 420 per household whereby fishing had larger mean (TZS 482 220) than other income sources. ANOVA results indicate average annual income from fishing per household was statistically significant higher than other sources at $p < 0.05$. The study concludes that alternative income sources, income from available sources and credit access are key areas for concern. The study recommends promotion of alternative income generating activities, accessible credit facilities and encourages organisations formation.

DECLARATION

I, Heavensophy Mfinanga, do hereby declare to the Senate of Sokoine University of Agriculture that this dissertation is my own original work done within the period of registration and that it has neither been submitted nor being concurrently submitted in any other institution.

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ACKNOWLEDGEMENTS

First and foremost, I would like to thank the Almighty God from whom my life is dwelling and through His incalculable Grace and Blessings throughout the period of the study, may His name be glorified.

I am very grateful to my supervisor, Prof. J. F. Kessy for his intellectual advice, personal commitment, assistance and intensive supervision that led to the completion of this work. I would also like to extend my sincere gratitude to Mr. Q. Nyanghura for his assistance, encouragement and constructive suggestions during the entire study period.

I am also indebted to Mr. A. Kiondo (Bagamoyo District Fisheries Officer), Ms. F. Massawe (Dunda Ward Fisheries Officer) and Ms. H. Msuya (Zinga Ward Fisheries Officer) for their support during my field data collection.

Last but not least, I would like to express my appreciation to my sisters (Tryruckia and Midlaster), brothers (Humphrey and Godlisten) and all my classmates for their encouragement, moral and material support which made my study successful.

God bless you all.

DEDICATION

This work is dedicated to my parents Mr Winnpamer Mfinanga and Azitha Canute who laid the foundation of my education, also to my husband Ireneus Rwiza and my daughter Divine for their patience and encouragement during the entire time of this study.

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LIST OF ABBREVIATIONS AND ACRONYMS

AIGAs	Alternative Income Generating Activities
ANOVA	Analysis of Variance
BDP	Bagamoyo District Profile
CRC	Coastal Resource Assessment
DFID	Danish Fund for International Development
FAO	Food and Agriculture Organisation of the United Nation
FDG	Focused Group Discussion
GDP	Gross Domestic Product
MANREC	Ministry of Agriculture, Natural Resources, Environment and Cooperatives (Zanzibar)
NBS	National Bureau of Statistics
TANGO	Technical Assistant to Non Governmental Organisation
TCMP	Tanzania Coastal Management Partnership
TZS	Tanzania shillings
URT	United republic of Tanzania
WWF	World Wide Fund for Nature

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Tanzania is well endowed with abundant natural resources from aquatic resource base. The total inland water area covers nearly 61 500 km² which is about 6.5% of the total land area. Country's marine coverage is about 64 000 km² for territorial sea and a coastal line of 1424 kilometres, while lakes coverage is 35 088 km² for Lake Victoria, Lake Tanganyika has 13 489 km² coverage followed by 5760 km² for Lake Nyasa. Others are 3000 km² for Lake Rukwa, 1000 km² for Lake Eyasi and 1000 km² for other small water bodies (URT, 2009). Most of these water bodies have substantial fisheries resources.

Fisheries management in Tanzania has been entirely operated and implemented by the government for many years. However the Government defines fisheries resources as common property that anyone can gain access to through the licensing system. This system has led to the increase of fishing effort scenario which in turn has caused a decline in fisheries resources (URT, 2010).

Fishing is an important economic activity in nearly all coastal villages and it is a major source of food and primary source of income (Silva, 2006). According to Bagamoyo District Profile (2009) about 90% of people in villages along the coast of Bagamoyo District depend on fishing for their livelihoods. However, the overdependence on marine resources is reported to cause reduction in productivity of marine resources and more emphasis have been done on reduction of fishing effort to allow regeneration of marine resources (Mkama *et al.*, 2010).

However, for the households to depend on particular economic activities there should be factors that influence their activity choice. According to Pattanayak *et al.* (2001 and Turner *et al.* (2003) households reliance on a particular economic activity for livelihood especially in natural resources may vary depending on the household economic characteristics and resource endowment. In this regard understanding of the factors that influence household's reliance on fishing for livelihoods is very important for proper intervention as far as declining of fisheries resources is concerned.

1.2 Problem Statement and Justification of the Study

Aquatic resources in Tanzania especially in coastal areas have come under threat due to the increase of population pressure and dependence on fisheries resources, which has led to the significant decline in the biodiversity and productivity of marine fisheries (Silva, 2006). According to TCMP (2007) the inshore fisheries of mainland Tanzania are over exploited due to over dependency of fishery resources by coastal people.

In Bagamoyo District fisheries resources has been degraded due to overdependence on fishing and therefore daily fish catch is reported to decline (CRC, 2005). Several studies concerning fisheries have been done in Bagamoyo District, for example Sesabo *et al.* (2007) did a study on technical efficiency and small-scale fishing households. Mkama *et al.* (2010) did a study on fisheries value chain analysis and recommended the reduction of fishing effort so as to allow fishery resources to regenerate.

Despite the fact that choice of fishing as a livelihood activity among the household can be influenced by several factors like income generated from fishing when compared to other income sources, time for earning income from fishing, land ownership, access to credit, lack of alternative livelihood activities, organisation participation, education level,

markets access (reliability of fish market), free access to water bodies and household size (Khan, 2000; Lanjouw *et al.*, 2001; Be'ne', 2003; Be'ne' *et al.*, 2003; Pender, 2004; Smith *et al.*, 2005; Hap *et al.*, 2006; Chenier *et al.*, 2006; Silva, 2006, and Roche, 2007). However it is not known which among those factors influence household decision and choose to be involved in fishing for livelihood and to what extent in coastal villages of Bagamoyo District. Therefore this study assessed economic determinants for household involvement in fishing for livelihood in coastal villages of Bagamoyo District. Specifically the study determined trend in the number of fishers for ten years, examined factors influencing household decision to be involved in fishing and analysed household income structure and its livelihood implication.

Findings of this study provide useful information to policy makers for effective policy reform for sustainable marine resources utilization while considering livelihood of the people. Furthermore, the findings are useful reference to other researchers who are interested to work further in fisheries studies.

1.3 Objectives

1.3.1 Overall objective

The overall objective of this study was to analyse economic determinants for households involvement in fishing for livelihoods in coastal villages of Bagamoyo District.

1.3.2 Specific objectives

The specific objectives were to:

- i. Determine trend in the number of fishers for ten year in coastal villages of Bagamoyo District (2000 to 2009)
- ii. Examine factors influencing households decision to be involved in fishing
- iii. Analyse household income structure and its livelihood implication

1.4 Research Questions

- i. What is the number of fishers between 2000 and 2009?
- ii. What factors are influencing household decision to be involved in fishing activities?
- iii. What are the main sources of household income?
- iv. What is the monthly household income?
- v. What is the proportion of each non fishing source in household income?
- vi. What is the contribution of fisheries to household income?

1.5 Conceptual Framework

Figure 1 explains the determinants of household involvement in fishing for livelihood. Households decision to be involved in fishing for livelihoods is an economic choice that can be influenced by a number of factors like income generated from fisheries when compared to other sources of income which is considered as comparative advantage by looking on the opportunity cost of income generated from fishing activities and other activities, time for earning benefit from fishing activities is shorter when compared to other activities like farming, size of land owned which can be a means of access to credit (collateral) as well as a factor of production, access to credit which is due to lack of formal and informal financial resources and markets access.

Other factors are household size, when the number of people in the family is high that means there will be high consumption in the family and this will influence involvement in fishing. Education, those with better education tend to have good access of better job when compared to those with low education so the lower the education the higher chance of fishing. Also organisation participation which creates social network and trust so can help in accessing credit as a group or individual within a group which lead low chance of

fishing. Access to water bodies which is due to the open access nature where there is no restriction in accessing the resources. Fishing can improve household livelihood security through selling of different harvested resources like fish, molluscs and crustacean which generate income. Therefore proper intervention will lead into sustainable fishing with improved livelihoods.

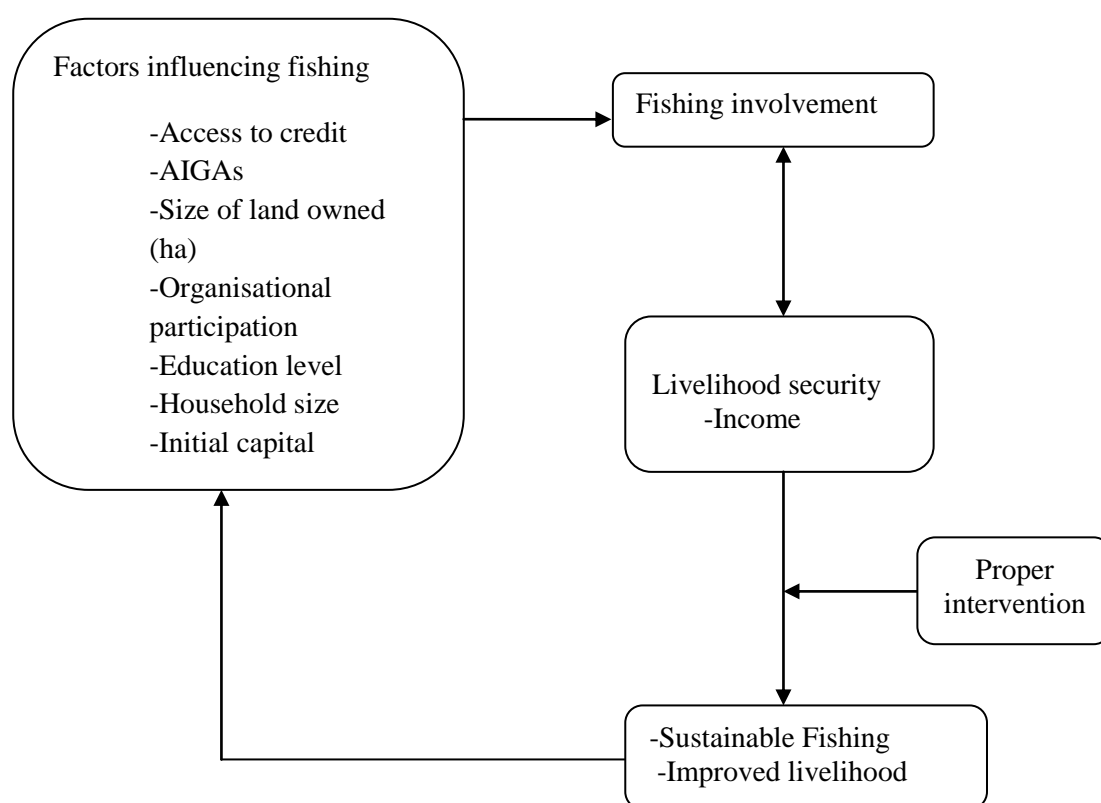


Figure 1: Conceptual framework for the study

1.6 Limitations of the Study

The study encountered several limitations particularly during the data collection exercise.

(i) Lack of willingness to disclose income information

Some households' were not willing to disclose their income level information due to the fear of insecurity in spite of the researcher's effort to explain the purpose of the study. However this was minimized by manipulating the questionnaire and the way of asking which made households to disclose their information unknowingly.

(ii) Poor recalling of information

Some of the respondents were unable to recall exactly their monthly income. This was thought to be caused by the nature of markets for their product especially fish market which was based on bargaining modalities. Therefore not only did they fail to remember monthly income generated from fishing but also the amount they sold was difficult to recall. Although this was minimized by asking the respondent number of fishing days and average income obtained daily which latter it was multiplied to get monthly income.

(iii) Poor record keeping

Poor record keeping was also a challenge especially in obtaining secondary data. This was because some of the officers claimed to be new staff and they were not given some of the data by the officers they replaced. This caused the researcher to spend extra time to seek required data. This was however solved after contacting the transferred officer who explained the location of the required data.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Fisheries Concept

Fisheries refer to an organized effort by humans to catch fish or other aquatic species, an activity known as fishing. Fisheries are good source of income, food and job creation (Bilame, 2012). Furthermore, fisheries can be defined as the exploitation of living aquatic resources held in some form of common or open access property regime which account for the bulk of organisms exploited, but invertebrates such as crustacean, molluscs and aquatic insects may also be important (Smith *et al.*, 2005). According to Blackhart *et al.* (2006) fisheries are activities leading to harvest fish; it may involve capture of wild fish or raised fish through aquaculture.

2.2 Importance of Fisheries Sector

2.2.1 Contribution of fisheries to the livelihoods

Fishing plays an important role in supporting livelihoods worldwide and also forms an important source of diet for over one billion people. Further, inland fisheries are of particular importance to the rural poor accounting for about 15% of total global employment (FAO, 2000).

Fishery sector has a lot of economic and social significance to the country of Tanzania. It contributes to around 10% of the national Gross Domestic Product (GDP) (URT, 2005). Fisheries provide important contribution to household income which gives access to other benefits like education, health services, clothing and other foodstuffs. Most of people in coastal villages of Bagamoyo District depend on fishing as a main economic activity although there are other economic activities performed by the households (Mkama *et al.*, 2010). This study analysed household income structure and livelihoods implication.

2.2.2 Contribution of fishery sector to the employment

Fishery sector continue to be a good source of employment to majority in developing country especially to those who are living along the coast (FAO, 2003). In Tanzania it is estimated about 172 090 fishers in marine and freshwater. Artisanal fishery is composed of 135 769 freshwater fishers and 36 321 marine fishers (URT, 2009). Nationally, it is estimated that about 4 million people are directly or indirectly employed in one way or another in the artisanal fisheries sub-sector which represents almost 10% of the entire population of Tanzania (URT, 2010). This study determine trend on the number of fishers in coastal villages of Bagamoyo District for ten years (2000-2009).

2.2.3 Contribution of fishery sector to the households food security

Food security can be defined as “a condition when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. Fishing provides direct supply of fish, either for consumption by fishers and their families, or through their sale at local markets. Usually fishers satisfy their subsistence needs first, before selling the rest of their catch (DFID, 2009). Fish are good source of protein, micro-nutrients and essential fatty acids, providing an important complement to the predominantly carbohydrate-based diet of many poor people (FAO, 2003). In Tanzania fish are major sources of protein to nearly one third of the country’s population by contributing about 30% of the total animal protein intake yearly (URT, 2005 and Sanga, 2006).

2.3 Economic Determinants for Households Decision to be Involved In Fishing

Involvement in fishing is an economical choice that is influenced by different factors. Difference of income generated from the available income sources can be used by

household as a comparative advantage (Roche, 2007) to pursue the activity which generate higher income with low cost of production (opportunity cost) than others.

However the study undertaken by Be´ne´ *et al.* (2003) in fishing community of Lake Chad revealed that, time taken to invest and get return in fisheries attract most of people to get involved in fishing because fishing generates instantaneous income when compared to other activities like farming which involves many risks. Nevertheless, land ownership revealed to be important factor in the choice of livelihood strategy, since it serves dual purposes: land can be used as factor of production as well as means of accessing credit (collateral) in some areas (Khan, 2000).

Likewise alternative income generating activities are revealed to be an influential factor for household involvement in fishing in the studies conducted by Acquah *et al.* (2011) in Ghana and that of Matiya *et al.* (2002) in Malawi. Fishing is considered to be the only easy accessible income generating activity to poor coastal people due to the open access nature of water bodies and the resources (Roche, 2007). Furthermore it was also argued by Silva (2006) that, low start-up (initial) cost of fishing is among the things influencing coastal people to be involved in fishing as it is compared with other activities that need high capital like agriculture which requires some assets like land and input like fertilizer.

The position of organisational participation in utilization of available economic opportunities especially accessing of credit has been argued for by different scholars such as Morris *et al.* (2001) and Khan (2005) of which in one way or another is considered to influence household livelihood activity choice like involving in fishing. As argued by Babulo *et al.*, (2008) that, poor access of credit influence utilization of available natural resources of which marine resource were not excluded.

Furthermore, (Smith *et al.*, 2005) argued that, low labour opportunity cost influence involvement in fishing among the coastal community as it involves own source of labour that most of the time does not require hiring someone. Likewise, household size plays important role in engagement in different non-farm economic activities (Lanjouw *et al.*, 2001) of which fishing is not excluded. As argued by Khan (2005) that higher household size might increase dependency problems which make part of its member to diversify their income sources and strives for more productive occupations. Furthermore the influence of education to household involvement in fishing was revealed in Ghana by the study conducted by Acquah (2011). The reason could be those with higher educational levels opt to seek better-paying job than fishing which is considered to be an activity for poor and illiterate people.

2.4 Sustainable Fisheries

Sustainable fisheries may be defined as the stewardship of the fisheries resources so as to provide economic and social benefits for the present while conserving the renewable resource base for future generations (Döring, 2000). Furthermore sustainable fishing can be considered as fishing activities that do not cause or lead to undesirable changes in the biological and economic productivity, biological diversity, or ecosystem structure and functioning from one human generation to the next. Fishing is sustainable when it can be conducted over the long-term at an acceptable level of biological and economic productivity without leading to ecological changes that foreclose options for future (Blackhart *et al.*, 2006) and fishery is considered to be not sustainable if total catch exceeds the maximum sustainable yield level (Berachi, 2003).

2.5 Threats to Fisheries

Main threat to fisheries is overfishing which can be caused by several factors like lack of incentive to fishers in order to leave fishing, poverty and open access nature of fisheries

(FAO, 2002 cited by Eggert *et al.*, 2009). In addition poor management of fisheries which caused by lack of management oversight, pirate fishing which is explained by illegal, unregulated and unreported fishing is also reported to be threat to fisheries (WWF, 2013).

In Tanzania the increasing number of fishermen is one of the major causes of declines in fish catches (MANREC, 2005). Also lack of fishing gear to many fishermen leads them to resort to cheap but destructive fishing practices such as dynamite or poison fishing, spear gun fishing, beach seine nets, drag nets, and gill nets with small mesh sizes which are commonly used due to inadequate enforcement of existing fishing regulations (Leon *et al.*, 2005).

2.6 Opportunities of Fisheries in Tanzania

Investment opportunities in the fisheries sectors are very attractive and numerous. These opportunities are found in different areas which include capture of fisheries, fish processing, manufacture of fishing craft and gears, aquaculture, trade in aquarium fish, fish marketing, supply of gears, engines, spare parts and consultant services (URT, 2009). In marine fisheries of Tanzania existing investment opportunities are in the Exclusive Economic Zone. Pelagic species that are possible exist for exploitation is Tuna and tuna-like species. Furthermore, inland fishery is an opportunities which found in the pelagic resources of lakes Victoria and Tanganyika. Available species in Lake Victoria are *Rastrineobola argentea* and in Lake Tanganyika possible species are *Stolothrissa* and *Limnothrissa sp* specifically in processing (URT, 2010).

Furthermore there are land based opportunities which are fishing craft: this is dominated by wooden fishing boats made from hardwood, this opportunity could be in the

manufacture of fibre glass boats, Ferro-cement boats or any other alternative cheap material. The market for boats exists in the artisanal fishing sub sector. Also there is a big domestic demand for fishing nets and other fishing gear. Also opportunities exist for further investment in the production of nets and other fishing gears like hooks, lines, and ropes of different sizes. Also there is another potential area in fish processing especially in fish canning industry and value added products (URT, 2009).

2.7 Livelihoods Concept

Livelihoods can be thought of as the way people make a living. Livelihood comprises of capabilities, assets (including both material and social resources) and activities required for a means of living (DFID, 1999). Livelihoods contribute to human wellbeing, which includes tangibles assets and goods for consumption. Livelihoods focus on what people are capable of doing with the opportunities they have, the obstacles they face and the outcomes they are able to achieve (Ngowi, 2008).

Livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base (Chambers and Conway, 1992). In most rural communities the capacity to resist poverty and to improve livelihoods often depends on the opportunities offered by natural resource-based production systems as conditioned by the wider economic, institutional and political environment. Livelihoods analysis prompts consideration of the resources or assets that are used for existence (including those owned, obtained through exchange and obtained through rights of access) and how these assets can be used in a range of activities. Variation in household access to assets is seen as a determinant of capability to cope with crises and analysis must consider external risk factors the “vulnerability context” (DFID, 1999) and the coping mechanisms of households. This is explained in Fig. 2 below;

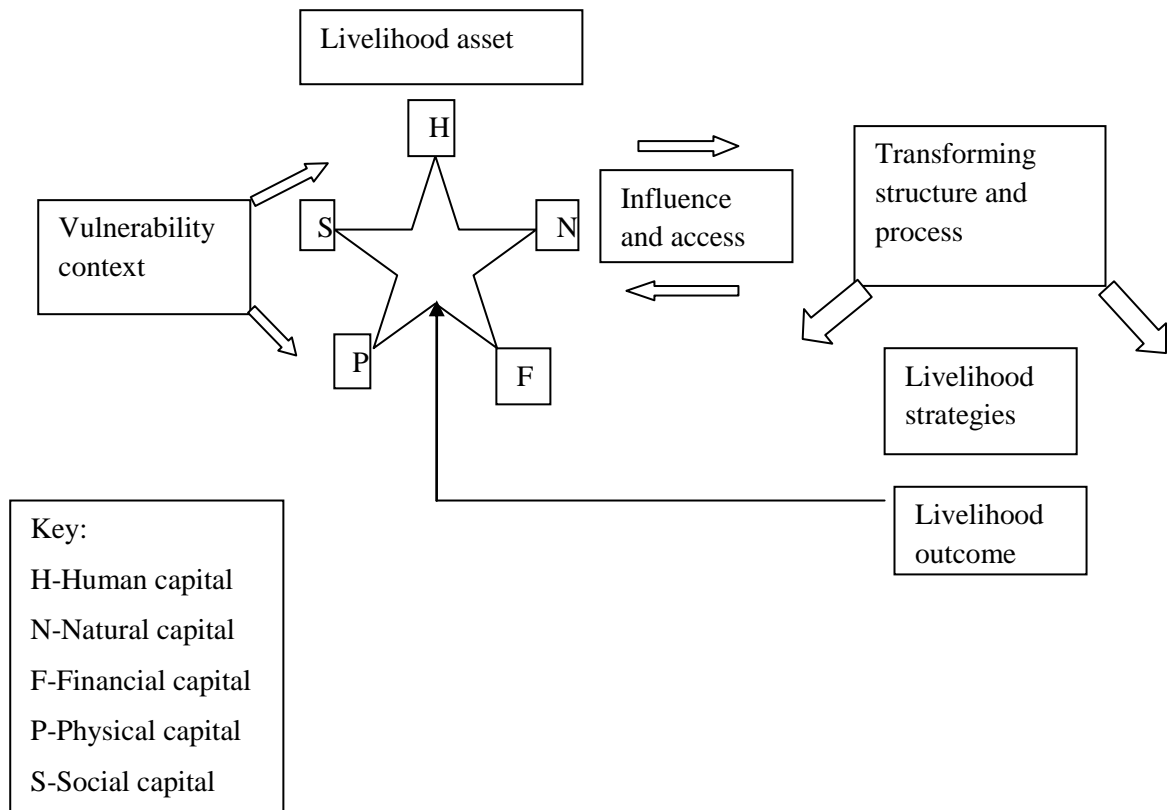


Figure 2: Modified DFID (1999) sustainable livelihood framework

Source: Adapted from Carney (2002)

According to Sustainable Livelihood Framework (SLF), five types of assets support livelihoods:

1. Natural capital (such as lands, water, fish stocks and forest);
2. Human capital (such as knowledge and skills);
3. Financial capital (such as income sources);
4. Physical capital (such as infrastructure and buildings);
5. Social capital (such as social network, association and trust).

These types of capital operate in the context of vulnerability, which is the context outside people's control. They can be transformed into livelihood strategies and finally into livelihood outcomes.

2.8 Livelihoods Diversification among Coastal People

In the developing world rural households pursue a wide range of livelihood strategies. Some households diversify their livelihood strategies, while others rely on one or few activities (Babulo *et al.*, 2008). Diversification is a key feature in livelihood strategy and is defined as the process by which rural families construct a diverse portfolio of activities and social support capabilities in order to survive and to improve their standards of living (Ellis, 2000). The degree of specialisation or diversification may relate to the resource endowments available and the level of risk associated with alternative options (Scoones, 1998). Diversification reduces the risk of losing all income sources simultaneously as a result of climatic or other shocks (Start, 2001). Although fishing seem to be valuable activities of the coastal people, as it does not necessarily require the ownership of any assets and has very low start up costs and most fishing households' in coastal areas are also engaged to some extent in agriculture, however there is less dependence on agriculture on the coast due to the lack of suitable soils for farming (Silva, 2006).

CHAPTER THREE

3.0 METHODOLOGY

3.1 Description of the Study Area

3.1.1 Location of the study area

Bagamoyo District is one of six districts in the Coast Region; others are Kibaha, Kisarawe, Mkuranga, Mafia and Rufiji. It is located in 6° 19' 60" S and 38° 30' 0" E of the equator. The District is in 75 kilometres north of Dar es Salaam. The District borders Morogoro District to the west; Mvomero, Kilindi, and Handeni Districts to the north; Pangani District on the north-east; the Indian Ocean on the east; Kinondoni District on the south-east and Kibaha District on the south. The District covers an area of 9847 km², while 855 square kilometres area is covered by water (Indian Ocean and rivers). The District is divided into six divisions, sixteen wards and eighty-two villages with 311 740 people (NBS, 2012).

3.1.2 Reasons for selecting study area

The selected three villages are among nine coastal villages of Bagamoyo District where fishing has been the most important economic activity to about 90% of people living in the areas (BDP, 2009). Beside the aquatic resources, the coastal areas are reported to be degraded and dropout of fish catch is pronounced, yet it is reported that people who depend on the marine resources for their livelihood are increasing hastily (CRC, 2005). Proper understandings on factors that influence household involvement in fishing for livelihood will enable proper interventions which may reduce resources overdependence.

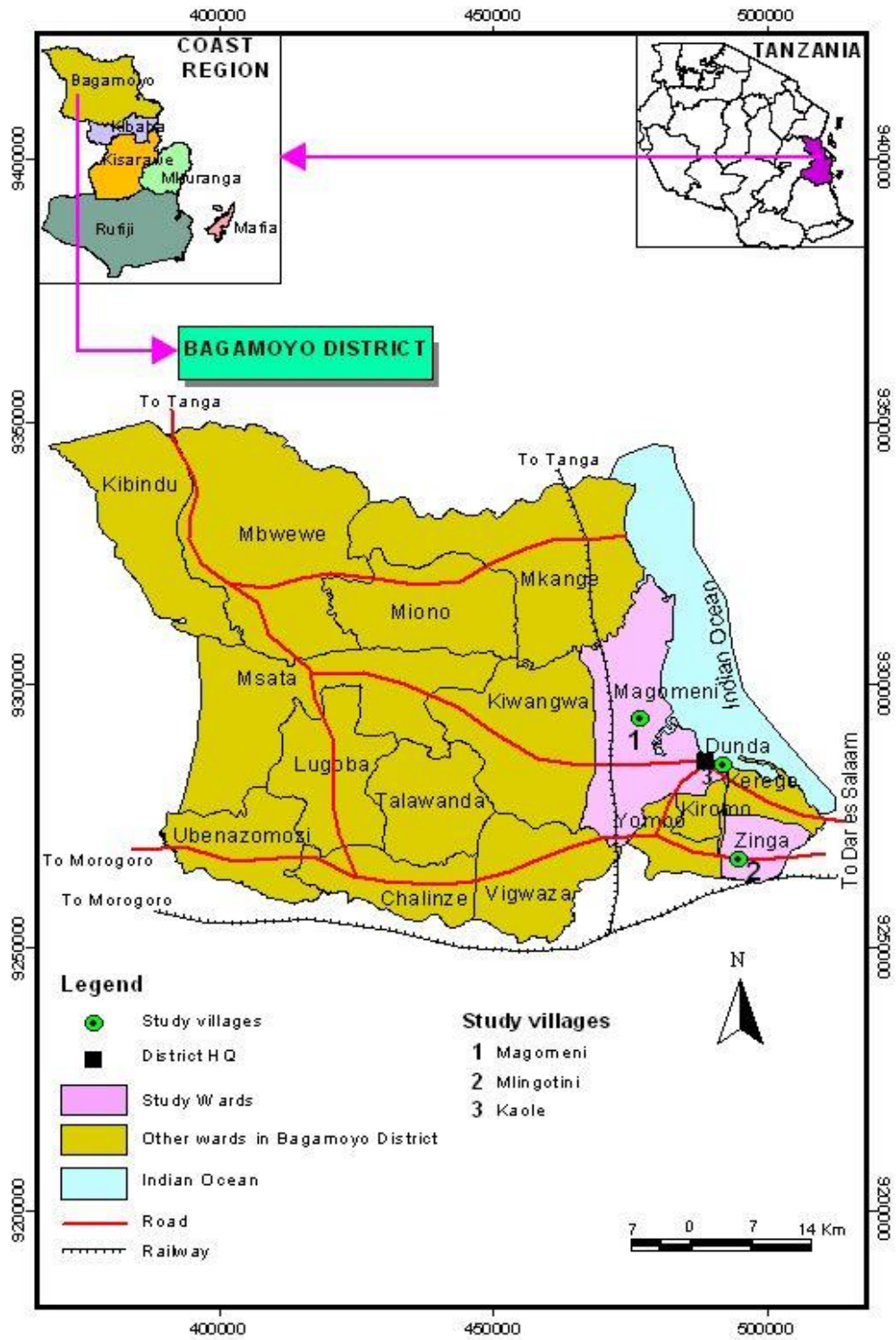


Figure 3: The Map of Bagamoyo District showing study villages

3.1.3 Economic activities

3.1.3.1 Fishing

Fishing is the most dominant activity for the majority of the people living in the three sampled villages. The importance of marine fisheries resources to the livelihoods of the local communities can be best appreciated because they provide nutritional requirements, creation of job opportunities and income generation among the communities. Artisanal fishing is the most important economic activity for the people in these villages. Fishing has been important due to the presence of the Indian Ocean, Ruvu and Wami deltas. The most common commercial fish in the area are Rabbitfish (*Tasi*), Parrotfish (*Pono*), Emperor (*Changu*), and Barracuda (*Mzia/Msusa*) (TCMP, 2007).

3.1.3.2 Small scale business

Apart from fishing some of people in coastal villages are engaged in petty business like retail shops, food vending and motor cycle driving commonly known as “*bodaboda*” but in most cases the traders are also involved in fishing as a primary source of income.

3.1.3.3 Farming

Besides fishing and its related activities, the local people along the coast are also engaged in farming activities. The crops grown include, rice, cassava, water melon, maize, coconuts, cashew nuts and vegetables. Farming is mainly for subsistence and to some as a source of cash but to majority fishing remains to be a primary source of income. Problems like low soil fertility, lack of agriculture extension services and lack of land access were mentioned to be the causes of reduction of productivity and low morale of cultivating.

3.1.3.4 Tourism

Tourism has been important due to the presence of several tourist attractions which comprise of fine beaches along the Indian Ocean, coastal cultural tourism, slave trade port, ancient Arab buildings, game reserves, national parks, marine parks, forest reserves, sports fishing and deltas. Other occupation include boat building, salt making, charcoal making, mangrove pole cutting, seaweed farming, wage labour, livestock keeping and traditional medicine (Elin *et al.*, 2006).

3.1.4 Climate and vegetation

There are two rain seasons with an average of 800mm to 1000mm per year. Peak precipitation occurs in April (238mm). Short rains are received during the period of October-December (25% of annual rainfall). Mean minimum temperature is of about 19 – 23°C and mean maximum temperatures of 29 – 32°C. Vegetation of the area comprises a mosaic of coastal forest, coastal bush land, thicket, grassland, *Brachystegia* (*Miombo*) woodland, fallow and mangrove forest which contain rare and endemic plant species (Semesi *et al.*, 1998).

3.2 Research Design

Cross-sectional research design was used whereby data was collected once. This is because of the nature of the study and the required data. This design allows data to be collected at single point in time and can be used for descriptive statistics as well as determining relationship between variables (Bailey, 1994; Babbie, 1999 and Kothari, 2004).

3.2.1 Sampling procedure and sample size determination

Simple random sampling was used to select three villages out of nine coastal villages of Bagamoyo District, respective village registers were used as a sampling frame for simple random selection of 90 households, 30 households from each of the selected village. Simple random sampling was preferred because each household had an equal chance of being selected (Deaton, 1997). According to Bailey (1994) and Yurdugul (2008) 30 respondents are minimum number recommended to represent a population under study.

3.2.2 Data collection

3.2.2.1 Primary data

(a) Questionnaire survey

Semi-structured questionnaire (Appendix 1) was used to obtain primary data. Sampling units for the study was the household heads. According to TANGO international (2004) a household is a core analytical unit that defines regular roles, rights and responsibilities across gender and age. Questionnaire was designed to collect socio-economic and demographic characteristics of the households.

(b) Checklist of questions

Checklist of questions (Appendix 2 and 3) was used to guide interviews with key informants. The key informants included village chair person, village elders and district fisheries officers.

(c) Focused group discussion (FGD)

Two focused group discussion with 8-10 people were conducted in each village. The participants of FGD were village elders both men and women who were familiar with village history especially on issues concerning trend of fishers in the village and fishing

stock harvested. The information was used to supplement information obtained from questionnaire surveys and key informants interviews. A set of questions was used to guide the discussion (Appendix 4).

(d) Field observation

Supplementary information was collected through personal observation in the field for the purposes of cross checking some of the information obtained through questionnaire especially on type of fisheries resources harvested.

3.2.2.2 Secondary data

Secondary data was collected through relevant literature reviews (published and unpublished documents). Other relevant sources used were Bagamoyo District fisheries office, internet and Sokoine National Agriculture Library.

3.2.2.3 Pilot study

Prior to the main survey, preliminary survey was conducted to pre-test the questionnaire before final administration to ascertain validity and reliability of the questions where 20 households were randomly selected for questionnaire pre-testing. Adjustment was done accordingly where it was necessary. This helped to understand the study population variability and selection of procedure for administering the research instrument.

3.2.3 Data analysis

Data obtained from questionnaire were summarized, edited and coded. Coding involved structuring the responses from open and close ended questions and assigning numerical codes to enable further analysis as suggested by Babbie (2007). Qualitative data analysis method was content analysis while quantitative data were analysed by descriptive and

inferential statistics. The analysis of quantitative data was done with the help of Statistical Package for Social Science (SPSS 16) and Microsoft excel.

3.2.3.1 Content analysis

Information obtained from key informants and the household heads were analysed by content analysis whereby raw data were broken down into meaningful units of information (Kothari, 2004). The information from key informants were grouped according to the study objectives and discussed to develop themes and tendencies to ascertain values and attitudes of respondents.

3.2.3.2 Descriptive statistical analysis

Information such as socio-economic characteristics, income sources, contribution of each economic activity to household income, land ownership, access to credit, reason for not accessing credit and organisational participation among the household were analysed descriptively into frequencies, percentages and mean and presented in tables and graphs.

3.2.3.3 Binary logistic regression model

Binary logistic regression model was used to analyse factors influencing household decision to be involved in fishing (Binary variables). This model is suitable when modelling variables with two alternative outcomes (Green, 2002) such as whether involve in fishing or not. The binary dependent variable was 1 if the household head was involved in fishing and zero (0) if not involved in fishing. This model was also used by Matiya (2002) who analysed socio-economic factors influencing people to become fishermen around Lake Malombe in Malawi and Acquah *et al.* (2011) who analysed socio-economic factors influencing people to become fishermen in central region of Ghana.

Quantitatively, the relationship between occurrences of the event depends on several variables which can be expressed as:

$$P = 1 / (1 + e^{-z_i}) = e^{z_i} / (1 + e^{z_i}) \dots \dots \dots (1)$$

Logistic regression uses the logit function in calculating the probability in the form of:

$$\text{Logit}(P) = \ln\left(\frac{P}{1-P}\right) = z = \beta_0 + \beta_1 X_{1i} + \dots + \beta_k X_{ki} + e_i \dots \dots \dots (2)$$

The binary logistic model for household decision to be involved in fishing is specified as follows:

$$P_i \text{Prob}(Y_i = 1) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 X_{1i} + \dots + \beta_k X_{ki})}} = \frac{e^{(\beta_0 + \beta_1 X_{1i} + \dots + \beta_k X_{ki})}}{1 + e^{-(\beta_0 + \beta_1 X_{1i} + \dots + \beta_k X_{ki})}} \dots \dots \dots (3)$$

Similarly

$$P_i \text{Prob}(Y_i = 0) = 1 - \text{Prob}(Y_i = 1) = \frac{1}{1 + e^{(\beta_0 + \beta_1 X_{1i} + \dots + \beta_k X_{ki})}} \dots \dots \dots (4)$$

Dividing (1) by (2) we get

$$\frac{\text{Prob}(Y_i = 1)}{\text{Prob}(Y_i = 0)} = \frac{P_i}{1 - P_i} = (e^{\beta_0 + \beta_1 X_{1i} + \dots + \beta_k X_{ki}}) \dots \dots \dots (5)$$

Where;

P_i = probability that Y takes the value 1 if the respondent is involved in fishing and then $(1 - P_i)$ is the probability that Y is 0 if respondent is not involved in fishing.

e = Natural logarithm which is 2.718.

β_0 = Intercept of the model i.e. the constant term of the model when the effect of the independent variables is held at zero.

$\beta_0 - \beta_k$ = Independent variable coefficients showing the marginal effects of the unit change in the explanatory variables on the dependent variable. The marginal effects were used in prediction equations on decision in involvement in fishing.

K= Total number of independent variables (k=9).

X_1-X_k = Explanatory variables (Alternative income generating activities, Access to credit, land size owned, organisation participation, education level, household size, sex age and marital).

Furthermore transformation was done to some variables which are household size, age, marital status and sex. According to Leydesdorff *et al.* (2006) logarithmic transformation of the data has been recommended in the case of skewed distributions commonly found in information science so as to make data match to the lognormal law of error for inferential purposes.

Independent variables can be explained as;

Alternative income generating activities (AIGAs) - (X_1)

This variable was meant to examine whether those who are involved in other income generating activities do not involved in fishing. This was trying to substantiate the fact that fishing is the last resort income for the people who do not have any other income generating activities. This was a dummy variable with 1 indicating the respondent was involved in other Income Generating Activities and 0 indicating no other Income Generating Activities. It can therefore be said that involvement in fishing is negatively related to IGAs since those involved in other IGAs will not adopt fishing.

Access to credit (X₂)

This was included to find out if access to credit has any influence in one's ability to become a fisherman. This was measured by respondent ability to access loan. This was recorded as a dummy variable with 1 if a person is able to access loan and 0 if otherwise. It is expected that adoption of fishing is negatively related to credit access as credit may be used as a capital for a person to invest in non fishing livelihood and forego fishing.

Land size owned (X₃)

Those who are landless can easily venture into fishing activities. It is therefore expected that a negative relationship should exist between involvement in fishing and land holding size. This was recorded in hectares.

Organisation participation (X₄)

This is a social capital which builds trust among members of the group. This helps in financial assistance and credit access within a group or outside the group which can improve household income and reduce chance of involvement in fishing as fishing is considered to be activity of the poor. It is expected that those who are members of non fishing social group have less chance of being involved in fishing so this should have negative relationship with the involvement in fishing.

Education level household head (X₅)

Those with formal education were expected to have access to better employed job or venture into other business rather than opt to go into fishing. It is therefore expected that a negative relationship should exist between involvement in fishing and education level. This was a proxy measure by years of schooling.

Household size (X₆)

Those with large family sizes would likely be involved in fishing, as they would not have enough resources to take care of the family members. Therefore some members would sell their labour or use traditional methods of fishing and become fishermen. Involvement in fishing is expected to be positively related to family size. This was recorded numerically (Number of people in the family).

Sex of the household head (X₇)

Usually sex is very important factor that influences income generating activities undertaken by a particular person. It was expected that more of the male household head can be involved in fishing because of the nature of the job. This was recorded in the model as dummy variable with 1 if the respondent is male and 0 if the respondent is female.

Age of household head (X₈)

Age influences someone to undertake a particular economic activity. It was expected that young household head is likely to be involved in fishing compared to the elders who have less energy. This was checked to find out if it has any influence on ones decision to become a fisherman. This is a quantitative variable included in the model presented in years.

Marital status of household head (X₉)

Behaviour of household in terms of responsibilities is depicted by the marital status of the head of household. Thus the marital status influences the household decision on livelihood activity choice like involvement in fishing. This was recorded as a dummy variable that is 1 if household head is married and 0 if otherwise.

3.2.3.4 One way analysis of variance (ANOVA)

One way Analysis of Variance (ANOVA) was used to compare means of annual household income generated from different sources. According to Kothari (2004) ANOVA is suitable to test differences among the means of the populations by examining the amount of variation within each of these samples, relative to the amount of variation between the samples. This method allows significant analysis amongst means obtained from different samples at the same time.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSIONS

4.1 Socio-economic Characteristics of Household heads

4.1.1 Gender of household heads

Findings in Table 1 show socio-economic characteristics of the household heads. The study reveals that among the surveyed households there were more male headed households (90%) than female headed households. These findings have an implication on the kind of economic activities that household adopt to sustain their livelihood especially to be involved in fishing. As argued by Be'ne' *et al.* (2003) fishing activity is believed to be male work due to its discomfort and also need much energy. However, Katani (1999) argued that, what is done within a specific socio-group is influenced by gender. This was revealed by the fact that most of the male household heads were the ones involved in fishing than female household heads who were engaged in other activities.

4.1.2 Age of household heads

Age is considered as a human capital. Table 1 shows that most of the heads of household (61.1 %) range between 26-45 years which is still considered as productive age to participate in various income generating activities like fishing since the activity need enough energy and it is not suitable for aged people and children. According to Smith *et al.*, (2005) fishing can mostly be done by people within the active age rather than elders and children. Age is also considered to affect experience, wealth and decision making (Singh *et al.*, 2003; Hoppe, 2002).

Table 1: Socio-economic characteristics of household heads

Variable	Sample villages			Total n=90
	Magomeni n=30	Kaole n= 30	Mlingotini n=30	
Sex				
Female	4(13.3)	2(6.7)	3(10.0)	9(10)
Male	26(86.7)	28(93.3)	27(90.0)	81(90)
Age (years)				
15 - 25	2(6.7)	1(3.3)	0(0.0)	3(6.7)
26- 45	15(50.0)	22(73.4)	18(60.0)	55(61.1)
46 - 55	13(43.3)	6(20.0)	7(23.3)	26(28.9)
<55	0(0.0)	1(3.3)	5(16.7)	6(3.3)
Marital status				
Married	24(80.1)	24(80.0)	26(86.6)	74(82.2)
Single	1(3.3)	3(10.0)	2(6.7)	9(10)
Widowed	5(16.6)	3(10)	2(6.7)	7(7.8)
Education level				
No formal education	6(20.0)	10(33.3)	8(26.7)	24(26.7)
Primary education	23(76.7)	20(66.7)	21(70.0)	64(71.1)
Secondary education	1(3.3)	0(0.0)	0(0.0)	1(1.1)
College	0(0.0)	0(0.0)	1(3.3)	1(1.1)
Household size				
2 - 4	10(33.3)	7(23.3)	5(16.7)	22(24.4)
5 - 7	15(50.0)	16(53.4)	22(73.3)	53(58.9)
< 7	5(16.7)	7(23.3)	3(10.0)	15(16.7)
Land ownership				
Own land	15(50.0)	7(23.3)	10(33.3)	32(35.6)
Do not own land	15(50.0)	23(76.7)	20(66.7)	58(64.4)
Organisational participation				
Participate	6(20.0)	2(6.7)	1(3.3)	9(10)
Do not participate	24(80.0)	28(93.3)	29(96.7)	81(90)
Credit access				
Have credit access	5(16.6)	0(0.0)	0(0.0)	5(5.6)
Do not have credit access	19(63.4)	29(96.7)	25(83.3)	73(81.1)
Do not know	6(20.0)	1(3.3)	5(16.7)	12(13.3)

Key: In brackets are percentages

4.1.3 Education level of household heads

Education of heads of household was assessed as a measure of human capital to households. As indicated in Table 1, the study shows that 71.1% of the household heads had primary education, while those with no formal education constitute higher percentage than those with secondary and college education. These findings imply that education level for most households is still low because primary education is still considered to be basic education and this might have direct influence in utilization of natural resources especially fisheries in the coastal area because it is the most available open access natural resource and does not need high education and specialized skills in its utilization.

As argued by Kessy and Njana (2009) cited by Hatibu (2010) high level of education can lead household head to make better understanding of livelihood challenges and make better decision in the choice of alternative solution to existing problems and undertake household livelihood strategies which are environmentally friendly. These findings are in line to that of Yuerlita *et al.* (2010) who reported that percentage of primary school education to households among fishing community was higher than other level of education in West Sumatra, Indonesia. It could be argued that education is an important factor in providing better livelihood option as it offers opportunity of better paid jobs and hence better livelihood outcome that can reduce dependence of fishing.

4.1.4 Households size

Table 1 indicates that 58.9% of households had the average household size of 5-7 people. This average household size is above the national average household size which is 4.8, above coast region average house hold size which is 4.3 and also it is above Bagamoyo District average household size which is 4.4 (NBS, 2012). Large household size has an implication in resource utilization because large household size means high consumption units within the household (Hatibu, 2010) which can lead to more extraction of the resources.

4.1.5 Land ownership

The study found that (64.4%) of the households in the study area do not own land which is more than half to those who own land (Table 1). These findings imply that there was relatively less land ownership to the people in the study area that could limit their livelihood diversification to land use economic opportunities like agriculture and loan accessing to formal financial sources that could be invested in other non fishing activities which may result into reduction of fishing dependence. As argued by Be'ne' *et al.* (2007)

lack of access to land is one of the major exclusion mechanisms that greatly affects fishing communities' livelihood and increases their vulnerability in the coastal area. Likewise Khan (2000) and Kumar (1996) report that land ownership is considered to be not only wide economic options but it is an important requirement in accessing credit from the formal banking system. Also for many rural households in sub-Saharan Africa, land is considered to be a key asset and serves multiple uses including cultivation, sustaining livestock, storing wealth and providing collateral for financial credit (Ley *et al.*, 2007). Ownership of land could be used as an opportunity on the decision made by household on the type of livelihood activity to choose.

4.1.6 Organisation participation

The findings in Table 1 show that (90%) of the households are not participating in any social organisation while the remaining percent are those who are members of different organisations. This has an implication in livelihood especially in loan accessing, this is because participating in an organisation is a social capital that enhances trust among group members and this can have some impact in credit acquisition as a group or as an individual within a group which might affect livelihood outcome through investing in different non fishing activities which might reduce dependence on fishing.

4.1.7 Access to credit

Findings in Table 1 show that most of households were not able to access credit (81.1%), while those who do not know if they can access credit or not had higher percentage than those who can access credit. These findings imply that lack of credit access can be an impediment for household to invest into non fishing activities due to shortage of capital and hence could influence their decision to participate in fishing. Households who can access credit are more likely to invest in non fishing activities than those who cannot

access credit. According to Paris (2002) and Brugère *et al.* (2008) lack of credit provision that is targeted to poor households with low assets has been identified as an important constraint for household to diversify their livelihood which influences their dependence on the available natural resources.

Table 2: Reason for not accessing credit

Reason	Village of respondent			
	Magomeni n=26	Kaole n=28	Mlingotini n=19	Total n=73
Lack of collateral	19 (26)	25(34.3)	17(23.3)	61(83.6)
High interest rate	7 (9.6)	3(4.1)	2(2.7)	12(16.4)

Note: In brackets are percentages

Households who were unable to access loan gave out different reason which hinder their loan access (Table 2). Lack of collateral was reported by (83.6%) while for the remaining percent the reason was high interest rate. Households showed their concern of being scared to lose their properties if they took loan and fail to pay back while some of them said they do not want to pay more money than what they took from the money lender because of high interest rate. The case of collaterals was seen as the most crucial limit in accessing credit. Carter and Walter (2004) reported that most commercial banks are risk sensitive when it comes to lending and most of people in developing countries are using land as collateral for obtaining credit. In the case of Tanzania in most of rural areas land is not formalized for credit access (Kidiru, 2009). Most people do not have title deeds for their land hence cannot lend money from formal financial sources. As it was reported by Elin *et al.* (2007) that high interest rate of micro credit and lack of collateral are obstacles for loan access to people in Bagamoyo. According to Payne (2000) artisanal fisheries are often in debt to money-lenders since they can offer little collateral, such as land, for formal credit. This may pressurise them into over-fishing and in an open-access situation, communities and interlopers scramble competitively for dwindling resources with

damaging results on the stocks. Also high interest rates make too risky for individuals to invest in new activities or even to expand their own current activities, thus reducing drastically the overall productivity of the households and also high interest rates make households more vulnerable to economic failures (Be'ne' *et al.*, 2007) which might influence extraction of natural resources to sustain life.

4.2 Trend in the Number of Fishers in Coastal Villages of Bagamoyo District

Figure 4 shows the trend in the number of fishers for ten years in coastal villages of Bagamoyo District from 2000 to 2009. Findings show that, there was an increase in number of fishers over the years. This indicates that livelihood of people in the study depend on the available marine resources. Probably this could be due to the facts that fishing seems to be the easiest income generating activity in coastal area as it generate daily income while other activities like agriculture has to wait for months before you get earning.

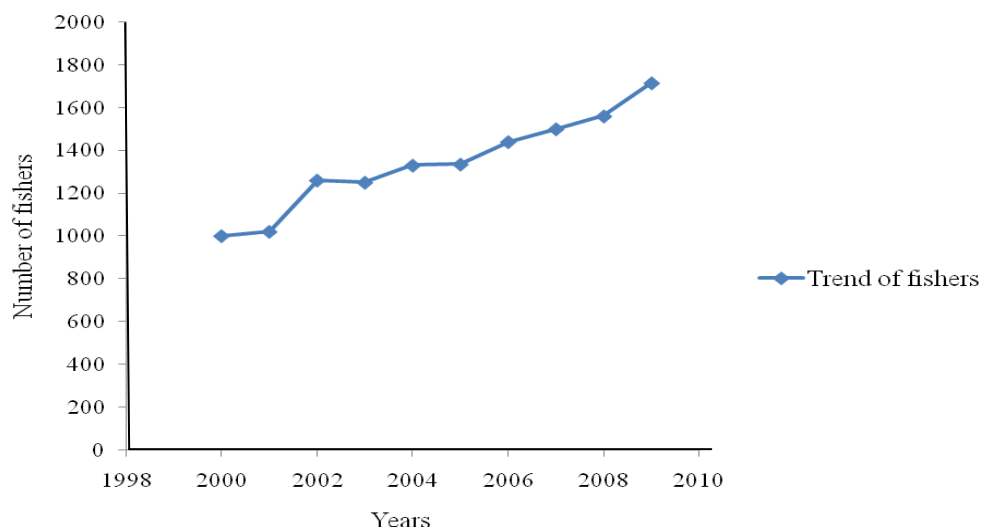


Figure 4: Trend in the number of fishers in coastal villages of Bagamoyo district
Source: Bagamoyo district fishery office

Moreover free access of the available water resource to anyone who is in need could be another reason which led the increase in number of fishers. According to the District Fisheries Officer, currently only 320 fishers own fishing licence out of 1715 fishers, this show how the resources can be accessed by anyone even without permit. These findings are in line with that of Maghimbi (1997) who report the increase in number of coastal marine fishers in Tanzania from 7596 in 1980 to 13 783 in 1997.

Furthermore, the increase in the number of fishers who extract marine resources to sustain their livelihood in Tanzania was also reported by the Ministry of Livestock and Fisheries (URT, 2009). Similary Rezaul *et al.* (1996) reported the increase of fishers number in Bangladesh from 450 000 in 1981 to 566 000 in 1994. Likewise Tewari *et al.* (1997) reported increase in number of marine fishers in India from 1 340 100 in 1977 to 3 420 647 in 1994. Increase in the number of fishers in coastal areas indicates the increase of marine resources utilization and probably might cause declining of resources, for this reason reduction of households dependence on fishing for livelihood is necessary through reduction in number fishers in order to sustain aquatic resources.

4.3 Factors Influencing Households Decision to Be Involved in Fishing

Binary logistic model was used to analyse factors which influence households' decision to be involved in fishing. Factors which included in the model were land size (ha), alternative income generating activities, access to credit and organisational participation, size of land, education level, age, sex and marital status. Other factors like reliable fish market, short time of earning income from fishing, family business, free access to water bodies and small initial capital for fishing were not able to be included in the model. These factors were analysed descriptively (Table 4).

4.3.1 Goodness of fit for the model

Table 3 indicates Hosmer and Lemeshow test of goodness of fit with the p value of 0.064. Since P- value is greater than 0.05 it indicates that the model has no evidence of lack of fit and it is considered to be desirable (Archer *et al.*, 2006). Nagelkerke coefficient of determination (R^2) measures was 0.890 implying that about 89% of the variation in the dependant variables were explained by independent variables included in the model. (Nagelkerke, 1991 and Tapsir *et al.*, 2010).

Table 3: Logistic regression results for factors influencing households decision to be involved in fishing

Variable	β	S.E.	Wald	df	Sig.	Exp(β)
AIGAS	-2.801	1.281	4.779	1	.029*	.061
Access to credit	-4.588	1.781	6.636	1	.010*	.010
Size of land owned	-.031	1.433	4.67	1	.001*	.915
Organisation participation	-2.535	1.609	2.482	1	.011*	.517
Education	-.144	1.919	4.057	1	.044*	.717
Household size	.045	1.584	5.234	1	.012*	12.101
Sex	30.887	1.363	.000	1	.998	2.594
Age(1)	-15.842	9.719	.000	1	.999	.000
Age(2)	-12.088	9.719	.000	1	.999	.000
Age(3)	-13.049	9.719	.000	1	.999	.000
marital	-1.494	4.399	.115	1	.734	.224
Constant	-39.922	2.145E4	.000	1	.999	.000

Key

(a) Model summary

* = Significant at 0.05;

LL = -2 log likelihood = 123.799;

Cox & Snell R-Square = 0.712; Nagelkerke R- Square = 0.890

Hosmer and Lemeshow test: Chi-square =15.844, df = 8; p = 0.064

(b) Table features

β = logistic coefficient or unstandardized logit coefficient, S.E = Standard error of the estimate, Wald = Wald statistic is squared ratio of the regression coefficient (β) of a particular independent variable to its standard error, df =degree of freedom, Exp (β) = odds ratio indicates the effect size of individual independent variable in the model

4.3.2 Interpretation of the model results

Table 3 indicates logistic regression results for factors influencing households decision to be involved in fishing. Factors which significantly influence household decision to be involved in fishing are alternative income generating activities, access to credit, size of

land owned, organisational participation, education level and household size. Other factors such as, age, sex and marital status were insignificant.

4.3.2.1 Alternative income generating activities

Results in Table 3 show that, alternative income generating activities were significantly influencing household decision to be engaged in fishing. The coefficient of alternative income generating activities was statistically significant at $p < 0.05$ probability level with the negative Beta ($\beta = -2.801$). This implies that those with more number of alternative income generating activities have less chance of being engaged on fishing. Odds ratio of involving in fishing decreases by a factor of 0.061 if households have alternative source of income. These results are consistent with that of Ikiara, (1999) who did the study in Kenya and Acquah *et al.* (2011) found the same results in Ghana. According to Salmi *et al.* (2008) lack of alternative income generating activities is a reason for continuing fishing in life time for most of coastal people. It could be argued that, lack of alternative source of income induce people to venture into fishing, this might be due to the reason that fishing is the income generating activity that can easily be accessed in coastal area.

4.3.2.2 Access to credit

Access to credit significantly influences household involvement in fishing (Table 3). The coefficient of access to credit was statistically significant at $p < 0.05$ probability level. The negative Beta ($\beta = -4.588$) implies that those who have access to credit have less chance of being involved in fishing than those who lack access to credit. Odds ratio of involving in fishing is decreased by a factor of 0.010 if households have access to credit from financial institution. These results are contrary to that of Matiya *et al.* (2002) who did a study in Malawi and Acquah *et al.* (2011) who did a study in Ghana and found access to credit were positively influencing people to become fisherman. The reason of

this result might be due to difference in countries economic and policy systems. Also easy access of loan can enable people to get money that could be invested in other income generating activities and reduce their involvement in fishing.

4.3.2.3 Size of land

The results revealed that size of land owned was statistically significant at $p < 0.05$ probability level in explaining involvement of household in fishing (Table 3). The negative coefficient ($\beta = -0.031$) implies that those with big size of land have lower chance of getting involved in fishing. Large size of land owned decreases households involvement in fishing by factor of 0.517. The plausible reason could be those with big land can cultivate more and get much yield which can result to higher household income thus can reduce chance of being involved in fishing and in some cases land can be used as a collateral to access credit. According to Elbers *et al.* (2001) land scarcity is related to participation in a low-return non agricultural activity of which fishing is among them.

4.3.2.4 Organization participation

In Table 3 results shows that organisation participation significantly influences household involvement in fishing. The coefficient of organisational participation were statistically significant at $p < 0.05$ probability level. The negative Beta ($\beta = -2.535$) implies that those who are members in different social groups have low chance of being involved in fishing activities and odds of involving in fishing decreased by a factor of 0.915 if households participates in social groups. Being a member in a social group may create trust and could be a potential means of acquiring credit that could be used for livelihood diversification and reduce chance of depending in available natural resources. According to Morris *et al.* (2001) social capital provides trust, reciprocity and associated morality that enable people both to work collectively and access wider political and civic institutions, and lack of

social capital might thus impede access and the sanctioned use of a number of resources like credit and land. Furthermore Khan (2005) argued that, participation in social institution and social relation is an important factor for accessing economic opportunities.

4.3.2.5 Education level of household heads

Table 3 shows that, education was statistically significant in influencing households involvement in fishing activities at $p < 0.05$ probability level. Negative beta ($\beta = -0.144$) implies that those people with higher level of education have lower chance of being involved in fishing activities with odds which decreases by factor of 0.717 if households have higher education level. The reason could be that education enables them to utilize any available opportunity in their premises for the sake of earning income. This means household with better education can choose better remuneration job and activity (Babulo *et al.*, 2008) rather than being involved in fishing as fishing is considered activity of the poor and illiterate people.

4.3.2.6 Households size

The results in Table 3 above showed that family size was statistically significant influencing households involvement in fishing at $p < 0.05$ probability level. The positive coefficient ($\beta = 0.045$) implies that greater number of people in the family increase the chance of being involved in fishing. The odds of involving in fishing are increased by factor of 12.101 when the household size increases. As argued by Lanjouw *et al.* (2001) greater number of people in the family plays an important role in engagement in different non-farm economic activities of which fishing is not excluded. The plausible reason could be that when the family is large also family needs increase and therefore more income is needed to accomplish them, this can lead to high extraction of the available resources including fish to sustain life.

4.3.2.7 Sex of household heads

The influences of sex to the household involvement in fishing were found to be insignificant (Table 3). These results are contrary to that of Matiya *et al.* (2002) who did a study in Malawi and found that sex was significant influencing people to become fisherman. This might be due to the facts that in the study area it was observed that some few women were also doing fishing by using less intensive gears like cast net especially those who are single parents, which means the activity does not exclude women if she is able to do so.

4.3.2.8 Age of household heads

Results in Table 3 show that age was insignificant in explaining households involvement in fishing. These results are in line to that of Acquah *et al.* (2011) who did a study in Ghana and found age was insignificant in influencing people to become fisherman. This might be due to the fact that in study area some elders were also doing fishing by using less intensive fishing gears like cast net which does not need much energy.

4.3.2.9 Marital status of household heads

The results reveal that marital status was insignificant in explaining households involvement in fishing (Table 3). These results are in line to that of Acquah *et al.* (2011) who did a study in Ghana and found marital status was insignificant in influencing people to become fisherman. This might be due to the facts that married people have much responsibilities which make them not relying on one source of income and unmarried ones are free to move looking for different sources of income as it is mentioned decrease of fish catch is a challenge to all who depend on fishing for livelihood therefore the effect marital status cannot be noted.

4.3.3 Other factors perceived to influence households involvement in fishing

Apart from factors that were included in the model, there are other factors that were perceived to influence household involvement in fishing (Table 4). Findings show that (100%) of the respondents were motivated to be involved in fishing due to its small initial capital. This implies that other income sources need high start up capital that is not preferred or affordable with people in the study area. As argued by Silva (2006) fishing seems to be attractive activity for poor who are living along the coast because it has very low start up cost.

Table 4: Other factors perceived to influence households involvement in fishing

Factor	Village of respondent			Total n=267
	Magomeni n=16	Kaole n=24	Mlingotini n=25	
Family business(Inherited business)	2(3.1)	2(3.1)	3(4.6)	7(10.8)
Readily available fish market	16(24.6)	24(36.9)	25(38.5)	65(100.0)
Short time of earning income	16(24.6)	24(36.9)	25(38.5)	65(100.0)
Small initial capital in fishing	16(24.6)	24(36.9)	25(38.5)	65(100.0)
Free access to water bodies	16(24.6)	24(36.9)	25(38.5)	65(100.0)

Note: n=267 due to multiple response; in brackets are percentages

Furthermore free access of water bodies was reported by all households who were involved in fishing to be important factor for their activity choice. This implies that open access nature of water bodies' cause majority of people who are living in the study area to get involved in fishing. These results are the same as what was argued by Smith *et al.*, (2005) that, open access of water body is among the source of coastal resources to be overexploited. Similarly short time of earning income from fishing was also reported to influence most of household to be involved in fishing. Probably because fishing generates income daily compared to other activities. This was also reported by Be'ne' *et al.* (2003) that people who are involved in fishing in Lake Chad basin appreciated the capacity of fishing to generate instantaneous income as compared to delayed returns from farming with many risk involved. In addition readily available fishing market was reported to

influence all interviewed households who were involved in fishing. The plausible reason might be because clients come to buy fish at the beach and sellers are not struggling to follow them at the market like other businesses. These findings are in line with those of Acquah (2011) who did the study in Ghana. Furthermore 10.8% report fishing to be a family business.

4.4 Household Income Structure and Its Livelihoods Implication

4.4.1 Household income sources

Table 5 shows household income sources in the study area. It shows that most of households (72.2%) are involved in fishing while the percent of those who are involved in agriculture is 27.8%. Those who are involved in petty business are 13.3% and the smallest percentage is for household who are engaged in wage labour (2.2%). These findings imply that livelihood of most people in the study area depend on fishing. The plausible reason might be that fisheries are the most available free accessed natural resources compared to other resources in the study area so it become the easiest option be utilized.

Table 5: Households income sources

Source of income	Village of respondent			Total n=104
	Magomeni n=30	Kaole n=30	Mlingotini n=30	
Fishing	16(17.7)	24(26.7)	25(27.8)	65(72.2)
Agriculture	10(11.1)	8(8.9)	7(7.8)	25(27.8)
Petty business	7(7.8)	2(2.2)	3(3.3)	12(13.3)
Wage labour	2(2.2)	0(0)	0(0)	2(2.2)

Note: Data was based on multiple responses; in brackets are percentages

These findings are in line to those of Mkama *et al.* (2010) who reported that, 70% -80% of the households in coast of Bagamoyo District were involved in fishing industry. Likewise Olawuyu *et al.* (2012) found that 71% of households were engaged in fishing to earn their living in Ode-Omi in Ogun state in Nigeria. Furthermore Yuerlita *et al.* (2010) argued that millions of poor coastal people in south-east Asia depend on fishing for their

living. Similarly the study conducted by Hazanaki *et al.* (2007) in coastal communities of estuarine region of Ribeira valley in south-eastern Brazil reveal that 81% of households' were engaged in fishing. These confirm the argument that fishing is the most accessible livelihood option to coastal people.

4.4.2 Contribution of various sources to household income

Table 6 shows contribution of various sources to annual household income. The findings show that total annual average income per household was TZS 1 065 420, however fishing had higher annual average income (TZS 482 220.00) which is 45.3% of the overall annual average household income. This is followed by wage labour which account for 25.9%, Agriculture contribute (19.8%) and petty business (9.0%).

Table 6: Contribution of various sources to household income

Income sources	Average annual income per household (TZS)			Total annual average income(TZS)
	Magomeni	Kaole	Mlingotini	
Fishing	137 220.00 (12.9)	165 000.00 (15.5)	180 000.00 (16.9)	482 220.00 (45.3)
Agriculture	112 500.00 (10.6)	15 100.00 (1.4)	83 600.00 (7.8)	211 200.00 (19.8)
Petty business	38 000.00 (3.6)	33 000.00 (3.1)	25 000.00 (2.3)	96 000.00 (9.0)
Wage labour	160 000.00 (15)	116 000.00 (10.9)	0.00 (0)	276 000.00 (25.9)
Total	447 720.00 (42.0)	329 100.00 (30.9)	288 600.00 (27.1)	1 065 420.00 (100)

This implies that livelihood outcome of people in the study area mostly depends on fishing due to the facts that households income generated from fishing was higher than income generated from other sources. Probably this might be due to the ability of fishing to generate daily income with low opportunity cost of running the activity which is different from other available activities. These findings are in line with those of Pittaluga *et al.* (2003) who found that, fishing has higher percentage contribution to household income than other sources in southern Volta Lake in Benin. Likewise Yuerlita *et al.* (2010) found that income generated from fishing was significantly higher annually than income generated from other activities in coastal people of West-Sumatra Indonesia.

Thus fishing is reported to be the primary source of income to most of household in the study area. The plausible reason could be due to the possibility of starting fishing activities with low capital which was mentioned to be not more than TZS 10 000.

4.4.3 Comparison of household income generated from various sources

The study found that households in the study area depend on various sources of income which are fishing, agriculture, wage labour and petty business. Result of Analysis of variance (ANOVA) show there was statistically significance difference ($p < 0.05$) on the annual household income generated from various sources (Table 7).

Table 7: One- way ANOVA for sources of income by individual household in the study area

Source Of Variation	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.367E+13	3	7.891E+12	30.670	.000*
Within Groups	2.573E+13	100	2.573E+11		
Total	4.940E+13	103			

Note: E+14=10¹³; E+13=10¹²; E+12=10¹¹; between groups= various sources of income; within groups=error term;* significant at $p < 0.05$

Furthermore, the results obtained in Table 7 were separated by Duncan Multiple Range to identify significant mean annual income differences (Table 8). Results show that average income per household per year obtained from fishing was significantly higher than other sources with the mean of TZS 482 220.00, while annual mean income from petty business was significantly lower than that of agriculture and wage labour. These results imply that fishing play a greater role to the livelihood of the household in study area than other income sources through generation of cash income therefore any effort to reduce fishing activities should take into account the issue of comparative advantage.

Table 8: Average annual households income from different sources

Source of income	Average annual income (TZS)
Fishing	4 82 220.00 ^a
Agriculture	211 200.00 ^b
Petty business	96 000.00 ^c
Wage labour	276 000.00 ^b

Note: ^{a, b, c} Mean with the different superscript letters are significant different at $p < 0.05$ following separation by Duncan Multiple Range Test.

These findings are contrary to that of Salmi *et al.* (2008) who found wage labour had significant large annual average income to coastal people of Finnish Archipelago Sea. Probably this might be due to the availability of wage labour, required skills to the people that have to be hired and country's employment policy.

4.5 Challenges Facing Households Depending on Fishing for Livelihood

Table 9 below indicate challenges facing households who depend on fishing for livelihoods. The finding shows that decrease of fish catch is a main challenge to all household who are involved in fishing. Furthermore climate change was also reported to some of them. The results have an implication to the livelihood outcome of the households and marine resources that both can be threatened.

Table 9: Challenges facing households for depending on fishing as a main livelihood activity

Challenges	Frequency	%
Climate change	56	86.2
Decrease of fish catch	65	100
Total	121	186.2

Note: n= 121 due to multiple response

This was also reported by CRC (2005) that daily catch per artisanal fisherman has declined in a way that the annual catch in 2005 was nearly half of 1994. Furthermore study by Acquah *et al.* (2011) found that unpredicted weather reported to be a challenge to most of fisherman in Ghana. Challenges can be used as a point of departure to reduction in number of fishers since some household showed their readiness to exit from fishing if and only if they get another activity which can generate income sustainably.

4.6 Contribution of Study to the Body of Knowledge

Factors that are revealed to influence households' decision to be involved in fishing are alternative income generating activities of which fishing seem to be the most accessible activity to coastal people, credit cannot be accessed to most people which hinder livelihood diversification and organisational participation which can be a tool to access available economic opportunities like loan. Consequently income generated from fishing is found to be higher than income generated from other activities (comparative advantage) which might also influence household to continue with fishing. Also size of land owner revealed to influence involvement in fishing since it can be used as a factor of production especially in agriculture and collateral for those who have title deed. Education level also revealed to influence decision because those with high level of education can be able to get better employed job and cannot opt for fishing than those with low level of education. This study confirm that, livelihood outcome of people in coastal villages of Bagamoyo District depend mostly on fishing and provide opportunities to change the overdependence on fishing by addressing the factors that influence households decision.

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

This study indicates that livelihood of people in the study area depends on the available marine resources (fishing) as the trend in the number of fishers in coastal villages of Bagamoyo District were revealed to increase from 1000 in year 2000 to 1715 in year 2009.

Factors that revealed to have negative influence on household decision to be involved in fishing for livelihood are alternative income generating activities, access to credit, size of land owned, organisational participation and education, while positive influential factor is household size. This means in order reduce overdependence on fishing and allow marine resources regeneration these factors have to be addressed properly.

Household income sources identified were fishing, agriculture, wage labour and petty business. However households involved in fishing constitute large percent (45.3%), followed by wage labour, agriculture and petty business respectively. These indicate that livelihoods of the people in the study area depend mostly on fishing.

Furthermore, household average annual income from fishing was higher (TZS 482 220.00) than other income sources and it constituted larger percentage of overall household annual average income. Analysis of Variance (ANOVA) showed that annual mean income generated from fishing were statistically significantly higher ($p < 0.05$) than other household income sources. These imply that fishing play big role to the livelihood of the household in the study area than other income sources through generation of cash income.

5.2 Recommendations

Based on the findings, discussion and the conclusion above, the following recommendations were drawn:

- i. Since this study reveal Bagamoyo District is currently using data of 2009, therefore fisherman census is recommended in order to get recent data which can be useful to make better future projection for proper policy intervention.
- ii. Credit facilities that are accessible and affordable to poor household should be extended to coastal people specifically in the study area to influence livelihood diversification which might reduce household dependence on fishing, since this study reveal that most of the households in the study area do not have access to credit to lack of collateral and high interest rate.
- iii. Organisation formation (social groups) among the household in coastal villages should be encouraged as it could be used as a potential means of acquiring credit as the study revealed that most of households were not members in any social group.
- iv. Viable alternative income generating activities that take into account comparative advantage with income generated from fishing should be promoted in the study area to encourage household to reduce fishing, as the study revealed that fishing generate higher household income than other income sources.
- v. This study suggest that future research should address on willingness of fisherman to forego fishing activities in order to find out how much people value fishing in order to promote suitable Alternative Income Generating Activities.

REFERENCES

- Acquah, H and Abunyuwah, I. (2011). Logit analysis of socio-economic factors influencing people to become fishermen in the central region of Ghana. *Journal of Agricultural Sciences* 56(1): 55 – 64.
- Archer, K. J. and Lemeshow, S. (2006). Goodness-of-fit test for a logistic regression model estimated using survey sample data. *The Stata Journal* 6(1): 97–105.
- Babbie, E. (1999). *Survey Research Method*. Wards Worth Publishing Co., Belmont, California. 335pp.
- Babbie, E. R. (2007). *The Basics of Social Research*. (Forth Ed.), Thomson Wardsworth, Australia. 576pp.
- Babulo, B., Muys, B., Nega, F., Tollens, E., Nyssen, J., Deckers, J. and Mathijs, E. (2008). Household livelihood strategies and forest dependence in the highlands of Tigray, Northern Ethiopia. *Journal of Agricultural System* 98(2): 147 – 155.
- Bailey, K. D. (1994). *Methods of Social Research*. Collier MacMillian, London. 478pp.
- BDP (2009). *The Bagamoyo District Profile*. Bagamoyo District, Bagamoyo, Tanzania. 65pp.
- Be´ne´, C. (2003). When fishery rhymes with poverty: A first step beyond the old paradigm on poverty in small-scale fisheries. *World Development* 31(6): 949 – 975.

- Be'ne', C. and Neiland, A. E. (2003). Contribution of inland fisheries to rural livelihoods in Africa: empirical evidence from the Lake Chad basin areas. *International Symposium on the Management of Large Rivers for Fisheries: Sustaining Livelihoods and Biodiversity in the New Millennium*, 11–14 February 2003, Phnom Penh, Cambodia. 357pp.
- Bene, C., Macfadyen, G. and Allison, E. H. (2007). *Increasing the Contribution of Small Scale Fisheries to Poverty Alleviation and Food Security*. Fisheries Technical Paper No. 481. Food and Agricultural Organisation, Rome, Italy. 125pp.
- Berachi, I. (2003). Bio-economic analysis of artisanal marine fisheries of Tanzania mainland. Dissertation for Award of MSc Degree at Norwegian College of Fishery Science, University of Tromsø, Norway. 46pp.
- Bilame, O. (2012). Contribution of Lake Victoria small-scale fisheries to poverty alleviation. A Case Study of Tanzania Small-scale Fisheries. *Agricultural Science and Technology 2*: 1268 – 1278.
- Blackhart, K., Stanton, D. G. and Shimada, A. M. (2006). *Fisheries Glossary*. National Oceanic and Atmospheric Administration Technical Memorandum, USA. 69pp.
- Brugère, C., Holvoet, K. and Allison, E. (2008). *Livelihood Diversification in Coastal and Inland Fishing Communities: Misconceptions, Evidence and Implications for Fisheries Management*. Sustainable Fisheries Livelihoods Programme. Food and Agriculture Organization, Rome, Italy. 39pp.

- Carney, D. (2002). *Sustainable Livelihoods Approaches: Progress and Possibilities for Change*. Department for International Development. London. 69pp.
- Carter, M and Walter, E. (Ed.) 2004. *Rethinking rural finance: A synthesis of the Paving the Way for Rural Finance Conference on Basis Collaborative Research Report Program*. University of Wisconsin Madison, 12 October, 2002. 123pp.
- Chambers, R. and Conway, G. (1992). *Sustainable Rural Livelihoods: Practical Concepts for the 21st Century*. Paper No. 296. Institute Development Studies, Brighton, University of Sussex. 24pp.
- Chenier, J., Jansen, H., Rodriguez, A., Damon, A., Pender, J. and Schipper, R. (2006). Determinants of income-earning strategies and adoption of conservation practices in hillside communities in rural Honduras USA. *Journal of Agricultural System* 88: 92 – 110.
- CRC (2005). *Community-based Fisheries Management Plan Manuscript*. Coastal resources center. University of Rhode, Island. 28pp.
- Deaton, A. (1997). *The Analysis of Household Surveys: A Micro Econometric Approach to Development Policy*. Johns Hopkins University Press, Baltimore. 479pp.
- DFID (1999). *Sustainable Livelihood Guidance Sheets*. Department for International Development, London, UK. 10pp.
- DFID (2009). *The Neglected Crisis of Under Nutrition: Evidence for Action*. Department for International Development, London. 22pp.

- Döring, R. (2000). *Concepts of Sustainable Fisheries*. Botanical Institute University, Greifswald. 11pp.
- Eggert, H. and Greaker, M. (2009). *Effects of Global Fisheries on Developing Countries: Possibilities for Income and Threat of Depletion*. Discussion Paper Series No. 393. Environment for Development, Sweden. 23pp.
- Elbers, C. and Lanjouw, P. (2001). Intersectoral transfer, growth and inequality in rural Ecuador. *World Development* 29(3): 481 – 496.
- Elin, T., Kalangahe, B., Munubi, R., Mwanahija, S. and Crawford, B. (2007). *Integrated Coastal Management, Livelihood Development and Micro-Loan Strategies: The Case of the Tanzania Coastal Management Partnership in the Bagamoyo District of Tanzania*. Coastal Resources Center, University of Rhode, Island. 14pp.
- Elin, T., Mmochi, A. and Spierling, P. (2006). *Bagamoyo Governance Baseline*. Coastal Resources Center, University of Rhod, Island. 24pp.
- Ellis, F. (2000). The determinants of rural livelihood diversification in developing countries. *Journal of Agricultural Economics* 51(2): 289 – 302.
- FAO (2000). Poverty in coastal fishing communities. Advisory committee on fishery Research third session. [www.fao.org/DOCREP/MEETING/003/X8905E.html] site visited on 20/8/2013.
- FAO (2003). *The State of Food Insecurity in the World*. Food and Agriculture Organization, Rome, Italy. 36pp.

- Greene, H. (2002). *Econometric Analysis*. Pearson education. Upper Saddle River, New Jersey. 802pp.
- Hap, N., Seng, L. and Chuenpagdee, R. (2006). *Socio-economic and Livelihood Values of Tonle Sap Lake Fisheries*. Inland Fisheries Research and Development Institute, Phnom Penh, Cambodia. 24pp.
- Hatibu, H. (2010). Contribution of Dry land forests to rural households livelihoods in Kishapu district, Shinyanga region, Tanzania. Dissertation for Award of MSc Degree at Sokoine University of Agriculture, Morogoro, Tanzania, 146pp.
- Hazanaki, N., De Castro, F., Oliveira, V. and Peroni, N. (2007). Between the sea and the land: The livelihood of estuarine people in south-eastern Brazil. *Ambiente and Sociedade* 10(1): 121 – 136.
- Hoppe, R. (2002). *Structural and Financial Characteristics of US farms*. Family Farm Report No 24. United State Department of Agriculture, USA. 134pp.
- Ikiara, M. M. (1999). Sustainability, livelihoods, production and effort supply in a declining fishery: The case of Kenya's Lake Victoria Fisheries. *Journal of Environmental Management* 67(2): 99 – 106.
- Katani, J. Z. (1999). Coping strategies against deforestation to gender based indigenous knowledge: A case of Mwanza district. Dissertation for Award of MSc Degree at Sokoine University of agriculture, Morogoro, Tanzania. 109pp.
- Khan, M. (2000). *Duality in the Countryside Canada*. Published in Dawn, Karachi, Pakistan. 51pp.

- Khan, M. A. (2005). *Patterns of Rural Non-farm Activities and Household Access to Informal Economy in Northwest Pakistan*. Discussion Papers No. 42. Institute of Rural Development, University of Goettingen. 40pp.
- Kidiru, C. (2009). Impact analysis of credit to borrowers in Tanzania. The case of Mbeya municipality. Dissertation for Award of MA Degree in Rural Development at Sokoine University of Agriculture, Morogoro, Tanzania, 64pp.
- Kothari, C. (2004). *Research Methodology, Methods and Techniques*. New Age International Publisher, New Delhi, India. 401pp.
- Kumar, B. L. (1996). Changes in the composition of rural labour force: Some evidence from a village resurvey. *Indian Journal of Labour Economics* 39(4): 809 – 816.
- Lanjouw, J and Lanjouw, P. (2001). *The Rural Non-farm Sector: issues and evidence from developing countries*. *The Journal of International Association of Agricultural Economists* 26(1): 1 – 23.
- Lay, J., M'Mukaria, G. M. and Mahmoud, T. O. (2007). Bodaboda rule: *Non Agricultural Activities and Their Inequality Implications in Western Kenya*. Kiel Working Paper No. 1314. Kiel Institute for the World Economy, Kiel Germany. 33pp.
- Leon, Y., Tobey, J., Torrel, E., Mwaipopo, R., Mkenda, A., Ngazy, Z. and Mbarak, F. (2005). *Marine Protected Areas and Poverty Alleviation: An Empirical Study of 24 Coastal Villages on Mainland Tanzania and Zanzibar*. In: Ruitenbeek, J., Hewawasam, I. and Ngoile, M. (Eds.), *Sustaining the Marine Environment, Zanzibar, Tanzania*. 125pp.

- Leydesdorff, L. and Bensman, S. (2006). Classification and Powerlaws: The Logarithmic Transformation. *Journal of the American Society for Information Science and Technology* 57(11): 1470 – 1486.
- Maghimbi, S. (1997). Population characteristics and trend of fishing communities in Tanzania and their relationship to the level of exploitation of fisheries resources. *Journal of population Studies and Development* 4(1): 54 – 66.
- MANREC (2005). *Rapid Assessment of the Proposed Pemba Channel Conservation Area*. Eco-Africa Environmental Consultants, Pemba, Tanzania. 83pp.
- Matiya, G., Wakabayashi, Y., Ng'ong'ola, D. and Takenouchi, N. (2002). A logit analysis of socioeconomic factors influencing people to become fisherman around Lake Malombe in Malawi. *Journal of Applied Sciences Research* 1(1):18 – 23.
- Mkama, W., Mposo, A., Mselemu, M., Tobey, J., Kajubili, P., Robadue, D. and Daffa, J. (2010). *Fisheries Value Chain Analysis Bagamoyo District Tanzania*. Coastal Resources Center. University of Rhode Island, Narragansett, USA. 28pp.
- Morris, M., Butterworth, J., Lamboll, R., Lazaro, E., Maganga, F. and Marsland, N. (2001). *Household Livelihood Strategies in Semi-Arid Tanzania*. Final Technical Report No. 7805. Natural Resources Systems Programme, Department for International Development, UK. 93pp.
- Nagelkerke, N. J. D. (1991). A note on a general definition of the coefficient of determination. *Biometrika Journal* 78(3): 691 – 692.

- NBS (2012). *Population and Housing Census, Population Distribution by Administrative Areas*. National Bureau of Statistics, Dar es Salaam, Tanzania. 66pp.
- Ngowi, S. E. (2008). The impacts of institutional change on miombo woodlands cover and livelihoods in Kimani catchment forest Iringa, Tanzania. Dissertation for Award of MSc Degree at Sokoine University of Agriculture, Morogoro, Tanzania, 104pp.
- Olawuyi, S. O. and Rahji, M. A. Y. (2012). Analysis of livelihood strategies of households' heads in Ode-Omi kingdom, Ogun-water side local government area, Odun state Nigeria. *International Journals of Research and Reviews in Applied Sciences* 11(2): 337 – 345.
- Paris, T. R. (2002). Crop-animal systems in Asia: socio-economic benefits and impacts on rural livelihoods. *Journal of Agricultural Systems* 71(2): 147 – 168.
- Pattanayak, S and Sills, E. (2001). Do tropical forests provide natural insurance? The microeconomics of non-timber forest product collection in the Brazilian Amazon. *Land Economics* 77: 595 – 613.
- Payne, I. (2000). *The Changing Role of Fisheries in Development Policy*. Natural Resource Perspectives No. 59. Overseas Development Institute, UK. 4pp.
- Pender, J. (2004). Development pathways for hillsides and highlands: some lessons from Central America and East Africa. *Food Policy* 29: 339 – 367.

- Pittaluga, F., Braimah, L. I., Bortey, A., Wadzah, N., Cromwell, A., Dacosta, M., Seghieri, C. and Salvati, N. (2003). *Poverty Profile of Riverine Communities of Southern Volta Lake*. Sustainable fisheries livelihoods programme No. 18. Food and Agriculture Organization, Cotonou, Benin. 76pp.
- Rezaul, K. and Hosain, M. (1996). *Population Characteristics and Trend of Fishing Communities in Bangladesh and Their Relationship to the Level of Exploitation of Fisheries Resources*. Tietze Report No. 566. Food and Agriculture Organization, Rome, Italy. 25pp.
- Roche, R. (2007). Livelihood approaches as a conservation tool. University of Rhode Island rural Ecuador. *World Development* 29(3): 481 – 496.
- Salmi, P., Salmi, J. and Mäkinen, T. (2008). Livelihood strategies and survival of small-scale fisheries in the Finnish archipelago sea. *American Fisheries Society Symposium* 49: 517 – 529.
- Sanga, J. G. (2006). An empirical accounting of fishery resource Lake Victoria in Tanzania. Dissertation for Award of MSc Degree at Sokoine University of Agriculture, Morogoro, Tanzania, 124pp.
- Scoones, I. (1998). *Sustainable Rural Livelihoods, a Framework for Analysis*. Working Paper No. 72. Institute for Development Studies, Brighton, UK. 22pp.
- Semesi, A. K., Mgya, Y. D., Muruke, M. H. S., Francis, J., Mtolera, M. and Msumi, G. (1998). Coastal resources utilization and conservation issues in Bagamoyo, Tanzania. *Ambio* 27(8): 635 – 644.

- Sesabo, J. K. and Tol, R. S. (2007). *Technical Efficiency and Small-scale Fishing Households in Tanzanian Coastal Villages: An Empirical Analysis*. *African Journal of Aquatic Science* 32(1): 51 – 61.
- Silva, P. (2006). *Exploring the Linkages between Poverty, Marine Protected Area Management, and the Use of Destructive Fishing Gear in Tanzania*. Working Paper No. 3831. World Bank Policy Research, Washington DC. 43pp.
- Singh, A. K., Srivastava, R. K., Sushilkumar, K. A., Bansal, R. P. and Tomar, V. K. S. (2003). Influence of age and literacy level of farmers on adoption of mint based crop rotations in the Indo-Gangetic plains. *Journal of Medicinal and Aromatic Plant Sciences, India* 25(3): 689 – 697.
- Smith, L. E., Lorenzen, K. and Khoa, S. (2005). Livelihood functions of inland fisheries: policy implications in developing countries. *Water Policy* 7: 359 – 383.
- Start, D. (2001). *Rural Diversification: What Hope for the Poor?* Meeting on rural development food security. Overseas Development Institute, London. 14pp.
- TANGO (2004). Measuring livelihood indicators. [mehrul@carebangladesh.org] site visited on 22/08/2013.
- Tapsir, H. and Fadhilah, A. H. H. (2010). Status and demand of technology for selected beef cattle producers in Peninsular Malaysia. *Economic and Technology Management Review* 5: 21 – 26.
- TCMP (2007). *Ecological Monitoring of Coral Reef in No-take and Fished Zones of Bagamoyo and Mkuranga Coasts*. University of Rhode, Island. 58pp.

- Tewari, A., Ratna, P. and Sign, R. (1997). *Population Characteristics and Trend of Fishing Communities in India and Their Relationship to the Level of Exploitation of Fisheries Resources*. Tietze Report No. 566. Food and Agriculture Organization, Rome, Italy. 27pp.
- Turner, B., Kasperson, R., Matson, A., McCarthy, J., Corell, R., Christensen, L., Eckley, N., Kasperson, J., Luers, A., Martello, M., polsky, C., Pulsipher, A. and Schiller, A. (2003). A framework for vulnerability analysis in sustainability science. *National Academy of Sciences* 100: 8074 – 8079.
- URT (2005). *Investment Opportunities in Fisheries Sector*. Fisheries division. The Ministry of Natural Resources and Tourism, Dar es Salaam, Tanzania. 240pp.
- URT (2009). *Annual Fisheries Statistic Report*. Fisheries Division. Ministry of Livestock Development and Fisheries, Dar es Salaam, Tanzania. 15pp.
- URT (2010). *Fisheries Sector Development Programme*. Ministry of Livestock and Fisheries Development, Dar es Salaam, Tanzania. 37pp.
- WWF (2013). Overfishing threats world wildlife fund. [<http://worldwildlife.org/threats/overfishing>] site visited on 26/08/2013.
- Yuerlita, K. and Sylvain, R. P. (2010). Livelihood features of small scale fishing communities: A case from Singkarak Lake, West-Sumatra, Indonesia. *International Journal of Environment and Rural Development* 1(2): 94 – 101.
- Yurdugul, H. (2008). Minimum sample size for cronbach's coefficient alpha. *Journal of Education* 35: 39 – 405.

APPENDICES

Appendix 1: Questionnaires for the household

1.0 General information

1.1 Name of household.....

1.2 Name of the ward.....

1.2 Name of the village.....

2.0 Household characteristics

2.1 Sex of the respondent Tick (✓)

i. Female ()

ii. Male ()

2.2 Age of respondent

i. 1.15-25 ()

ii. 2.26-45 ()

iii. 3.46-55 ()

iv. 4.55+ ()

2.3 Marital status

i. Married ()

ii. Divorced ()

iii. Single ()

iv. Widowed ()

2.4 Level of education

i. Illiterate () iii. Secondary ()

ii. .Primary () iv. College ()

2.5 Household size (number of family member).....

Household size	Male	Female	Number of Dependant	Number of income earning

3.0 Household income structure and livelihood implication

3.1 Are you involved in fishing?

Yes () No ()

3.2 Where do you do those fishing activities?

Ocean () River ()

3.3 Do you own fishing license

Yes () No ()

3.4 What type of gear(s) do you use.....

3.5 What type of marine resources do you harvest?

Resource type	Amount harvested(kg) per catch	Reason for harvesting			Number of catch per month	Average price per kilogram
		Self consumption	cash	Food and cash		
Fish						
Crabs						
Moluscs						

3.6 What is your monthly income from fishing.....

3.7 If you use fish as a source of food, how many times do you eat them per week.....?

- a. 1-3 ()
- b. 4-6 ()
- c. More than 6 times ()

3.8 If there is no income from fishing, will it be possible for you to meet family needs

Yes () No ()

3.9 If yes how.....

4.0 Apart from fishing, do you have other economic activity(s)?

Yes () No ()

If yes in 4.0 above, mention them

Activity	Income
1.Fishing	
2.Petty business	
3.Wage labour	
4.Agriculture	
5.Others (specify)	

5.0 Factors influencing households decision to be involved in fishing for livelihood

5.1 When did you start fishing activities (year).....?

5.2 What is your comment on fish catch from when you start harvesting until current harvesting?

- i. Increase
- ii. Decrease
- iii. No changes

5.3 Do you think, what are the main causes of 2 in 5.2 above.....?

5.4 What is the main market for your fish products.....?

5.5 What is the distance from the fishing site to the market (km)....?

5.6 Does section 5.5 above have any contribution for your involvement in fishing...?

Yes () No ()

5.7 What is the main market for other products (none fish products).....?

5.8 What is the distance to the market of other products (none fish products)

5.9 Does the 5.8 above affect the choice of economic activities?

Yes () No ()

6.0 If yes, How.....?

6.1 What is the mode of water bodies' access?

- i. Restriction
- ii. No restriction

6.2 Do you own land?

Yes () No ()

6.3 If yes in 6.2 above, what is the size (ha).....?

6.4 Do you have access to loan?

Yes () No ()

If yes, mention the source of loan

- i. SACCOS
- ii. Bank
- iii. Others (specify)

6.5 If no, in 6.4 above, why

6.6 How long it takes for you to harvest (benefit) in your economic activities...? (Specify in each activity).

Activity	Duration until harvesting
a. Fishing
b. Agriculture
c. Petty business
d. Wage labour
e. Others (specify)

6.8 Do 6.6 above have any influence for your involvement in fishing..?

Yes () No ()

6.9 What is the initial cost in fishing activities...?

7.0 What is the initial cost in other activities...?

7.1 Does the initial cost have any influence for you to be engaged in fishing...?

7.2 Do you participate in any organisation (association)...

Yes () No ()

If yes, mention the organisation.....

7.3 Do you get any benefit from your participation?

Yes () No ()

If yes in 7.3 above, explain.....

7.4 What factors influence your involvement in fishing activities...?

S/N	Factor	Yes	No
1	Lack of alternative source of income		
2	Easy available fish market		
3	Family business		
4	Small initial capital		
5	Short time of earning fishing income		
6	Free access of water bodies		

7.9 What are challenges you face for depending in fishing as a source of livelihood?

- i.
- ii.
- iii.

Thank you for your cooperation

Appendix 2: Check list for village leaders key informants

1. Name of the village.....
2. What are the main types of fish harvested?
3. What factors cause people to rely on fishing for livelihood?
4. What should be done to reduce number of fishers along the coast?

Appendix 3: Checklist for village elders in focused group discussion

1. Name of a village.....
2. What are the main types of fishery resources harvested?
3. What is the current stock of status of marine resources as compared to past years?
5. Do you think why people rely on fishing for livelihood?
6. What should be done to improve marine resources along the coast?
7. What should be done to reduce number of fishers along the coast?

Appendix 4: Checklist for district fisheries officer

1. How marine resources are managed along the coast?
2. What is the trend in the number of fishers in coastal villages for past ten years?
4. What is your opinion about status of marine resources for past five years?
5. What are the major threats of marine resources along the coast?
6. What is your comment on livelihood diversification among the fishers in the district?
7. Do you think why most people are depending on marine resources for their livelihood?
8. What should be done to reduce overdependence of marine resources to coastal people?

Appendix 5: Type of fish harvested in coast of Bagamoyo district

English name	Scientific name
Lobster	<i>Panulirus ornatus, P. versicolor, P. longipes</i>
Rabbit fish	
Mackerel	<i>Rastrelingerkanagurta</i>
Pompano	<i>Trachynotus spp.</i>
Emperor fish	<i>Lethrinus spp., Lutjanus spp.</i>
Sardine	<i>Sardinella gibbosa</i>
Sweetlips	<i>Diagramm pictum, Plectorhinchus hubbi</i>
ray fish	<i>Rhinoptera javanica</i>
Octopus	
Parrot fish	<i>Leptoscarus spp.</i>
Tuna	<i>Euthynnus sp. and Thunnus sp.</i>
Shark	

Source own field data

Appendix 6: Binary logistic multiple regression full modal results

Variable	β	S.E.	Wald	df	Sig.	Exp(β)
Step1 ^a						
AIGAS	-2.801	1.281	4.779	1	.029*	.061
Access to credit	-4.588	1.781	6.636	1	.010*	.010
Size_land	-.031	1.433	4.67	1	.001*	.915
Organisation_part	-2.535	1.609	2.482	1	.011*	.517
Education	-.144	1.919	4.057	1	.044*	.717
House_size	.045	1.584	5.234	1	.012*	12.101
Sex	30.887	1.363	.000	1	.998	2.594E13
Age			3.373	3	.338	
Age(1)	-15.842	9.719	.000	1	.999	.000
Age(2)	-12.088	9.719	.000	1	.999	.000
Age(3)	-13.049	9.719	.000	1	.999	.000
marital	-1.494	4.399	.115	1	.734	.224
Constant	-39.922	2.145E4	.000	1	.999	.000

a. Variable(s) entered on step 1: AIGAS, Access_credit, size_land, Organisation_part, Education, Sex, Age, House_size, marital

Appendix 7: Type of marine species harvested in Tanzania

English name	Local name	Representative Species	Habitat
Anchovy	Uono	<i>Stolephoruscommersonii</i> , <i>Encrasicolinapunctifer</i> , <i>E. devisi</i>	Pelagic
Sea Catfish.	Hongwe	<i>Arius spp</i>	Estuaries; Mangroves
Cobia	Songoro	<i>Rachycentroncanadum</i>	Pelagic
Crabs	Kaa	<i>Scylla serrata</i>	Estuaries; Mangroves
Emperor fish.	Changu	<i>Lethrinus spp.</i> , <i>Lutjanusspp</i>	Reef
Goatfish	Mkundaji	<i>Parupeneusindicus</i>	Reef
Grouper	Chewa	<i>Epinephelus spp.</i>	Reef
Lobster	Kambakoche	<i>Panulirusornatus</i> , <i>P. versicolor</i> , <i>P. longipes</i>	Reef
Mackerel	Nguru	<i>Scomberomoruscommerson</i>	Pelagic
Mackerel	Vibua	<i>Rastrelingerkanagurta</i>	Pelagic
Mojarra	Chaa	<i>Gerres spp.</i>	Sandy bottom
Mullet	Mkizi	<i>Mugilcephalus</i>	Pelagic
Octopus	Pweza	<i>Various</i>	Reef
Parrotfish	Pono	<i>Leptoscarus spp.</i>	Reef
Pompano	Kolekole	<i>Trachynotus spp.</i>	Pelagic
Rabbit fish	Tasi	<i>Siganus spp.</i>	Reef
Ray	Taa	<i>Rhinopterajavanica</i>	Reef
Sardine	Dagaa	<i>Sardinellagibbosa</i>	Pelagic
Sea Cucumber	Jongoo	<i>Holothuriascabra</i>	Reef
Shark	Papa	<i>Various</i>	Various
Shell, Oyster	Chaza	<i>Ostreaamasa</i> , <i>Pinctada spp.</i> <i>and Saccostreacucullata</i>	Estuaries; Mangroves
Shells	Komee	<i>Cypraeatigris and</i> <i>Cypraeacassisrufa</i>	Beach
Snapper	Fimbo	<i>Aprionvirescens</i>	Reef
Snapper	Kelea + Maginge	<i>Lutjanusspp</i>	Reef
Squid	Ngisi		Reef
Sweetlips	Komba	<i>Diagrammapictum</i> , <i>Plectorhinchus</i> <i>chubbi</i>	Reef
Tuna	Jodari	<i>Euthynnussp and Thunnus sp.</i>	Pelagic
Unicorn fish	Puju	<i>Nasounicornis and N. hexacanthus</i>	Reef

Adopted from Silva, 2006