

**THE CONTRIBUTION OF MANGROVE FORESTS TO THE LIVELIHOODS OF
ADJACENT COMMUNITIES IN TANGA AND PANGANI DISTRICTS**

BY

ANNA NGOMELA

**A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE
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ABSTRACT

Mangrove ecosystems play crucial role in protection of coastlines. Apart from this most people living adjacent to these ecosystems depend on this resource to meet basic socio-economic needs and livelihoods. Though Joint Forest Management has been practiced in mangrove ecosystem for a significant period now little if any is quantitatively documented on the contribution of mangrove products to the livelihoods of communities. This study aimed at identifying and assessing the existing and potential mangrove products and their contribution to local people livelihoods in Tanga and Pangani Districts. Specifically the study assessed availability of the products, extent to which the products contribute to household income and other forest based goods. Socio-economic data were collected in Chongoleani, Machui, West Pangani and Kipumbwi villages through questionnaires and discussions with key informants. The Statistical Package for Social Science and Excel programs were used to analyse socio-economic data and Content and Structural-Functional Analysis techniques were used for qualitative data. Findings from the study showed, firewood was the major product obtained and accessed from mangrove ecosystems followed by mangrove poles, fish, bee products and crabs. The accessibility of the products is through permits which are obtained from the village environmental committees and District Mangrove Officer. Males earned an average income of about 1 704 000 Tshs per year and females earned 3 027 000 Tshs per year from trade in mangrove products. On the other hand the average income from other sources was reported to be 1 058 000 Tshs per year for males and 958 900 Tshs per year for females. It is concluded that mangrove ecosystem have moderate contribution to livelihood. The study recommends strengthening of local institutions and increasing people's awareness on sustainable utilization of mangrove ecosystems in order to increase positive attitude on conservation and hence increase the availability of products, income and improve livelihoods.

DECLARATION

Anna Ngomela
(MA. Candidate)

Date I, Anna Ngomela do hereby
declare to the SENATE of the
Sokoine University of
Agriculture that this
dissertation here is my own
original work, and has not
been submitted for a degree
award in any other University.

The above declaration is confirmed

Prof. Munishi P.K.T.
(Supervisor)

Date

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DEDICATION

This Dissertation is dedicated to my beloved parents; Mrs. Magreth Lushiku and Mr. Ladislaus Ngomela who laid foundation for my education. “May the Almighty God bless them”.

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ABBREVIATIONS AND SYMBOLS

CANARI	-	Caribbean Natural Resources Institute
DCs	-	Developing Countries
DMO	-	District Mangrove Officer
FBD	-	Forest and Beekeeping Division
IGAs	-	Income Generating Activities
JFM	-	Joint Forest Management
LDC	-	Least Developed Countries
MMP	-	Mangrove Management Project
MNRT	-	Ministry of Natural Resources and Tourism
NPES	-	National Poverty Eradication Strategy
NRM	-	Natural Resource Management
NWFP	-	Non-Wood Forest Products
PFM	-	Participatory Forest Management
PRSP	-	Tanzania's Poverty Reduction Strategy Paper
SFM	-	Sustainable Forest Management
SNAL	-	Sokoine University of Agriculture National Library
TCMP	-	Tanzania Coastal Management Partnership
TDV	-	Tanzania's Development Vision
URT	-	United Republic of Tanzania
Tshs	-	Tanzania shillings
ha	-	hectare
km	-	kilometer

mm - millimeter

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background information

Mangrove forests occur world wide, though restricted to the tropical regions where they occur at the coastal areas of many countries (Adegbehin *et al.*, 1990). The word mangrove has been used to refer to the plants of tropical intertidal forest communities or to the community itself (Semesi, 1991). Mangroves are trees and bushes growing below the high water level of spring tides.

“Mangrove” is a general term applied to an association of physiologically specialized plants inhabiting muddy, swamps, creaks, delta and shelter sea coasts periodically inundated by tides (Banyikwa and Semesi, 1986). The trees are only one component of the complex mangrove ecosystem, which includes associated bodies of water, substrates as well as a variety of other plants, animals and micro-organisms (Semesi, 1991). In Kiswahili the mangrove ecosystem or forest is referred to as *kapa* or *kokoni* and the mangrove trees as *mikoko*.



Plate : Mangrove forest at Chongoleani Village, in Tanga District.

Tanzania has a total area of about 945 000 km², of which Mainland covers about 881 000 km² and Zanzibar covers about 2000 km². The remaining 62 000 km² is covered by water [<http://www.tanzania.go.tz>] (26/5/2007). The country is well – endowed from natural resource point of view with forests and woodland covering a total of about 38.8 million hectares of forests and woodlands (MNRT, 2002). The country is well – endowed from natural resource point of view, with forests and woodland covering a total area of about 38.8 million hectares of forests and woodlands (MNRT, 2002). Mangrove forest reserves cover a total of 115 500 hectares which is about 4% of the total forestland (Kijazi, 2006).

In Tanzania mangrove forests are found in all coastal districts from Kenya boarder in the North to as far as Mozambique in the South and the total length covered by the ecosystem is 800 km. There are about 8 species of mangrove trees in Mainland Tanzania though not all are found in every intertidal area. The major mangrove species in Tanzania are *Rhizophora mucronata* (Mkoko or mkaka), *Sonneratia alba* (Mlilana or mpira), *Ceriops tagal* (Mkandaa), *Bruguiera gymnothiz* (Msinsi or mshinzi), *Arvicennia marin* (Mchu), *Lumnitzera racemosa* (Mkangaa dume), *Xylocarpus granatum* (Mkomafi) and *Heritiera littoralis* (Msikundazi or mkungu) (MNRT, 1991).

The largest area of mangrove is found in Rufiji Delta (53 255 ha). Fairly large areas are also found in Tanga (9403 ha), Bagamoyo (5636 ha) and Kilwa (22 429 ha) (Semesi, 1991). Mangrove forests are considered critical provider or source of wood and non-wood products: timber, fuel wood, charcoal, building poles, materials for boat construction, tannin and traditional medicines and as animal fodder and vegetables. Moreover, mangrove forests serve as great tourist attractions and have important scientific value.

Mangroves also provide nectar for large populations of bees and therefore beekeeping is an economic activity that is to be more fully developed in mangrove forests. Fisheries within the mangrove ecosystem are valuable resources to local communities.

Mangroves can also serve as natural means of controlling coastal erosion and buffering against the destructive forces of typhoon, hurricanes and cyclones, as nursery and feeding ground for many commercially important fish, shrimps and other marine organisms. It has been documented by the World Bank that Sub-Saharan Africa is the world's poorest region in the context of income, poverty and access to social services. Amalu (2005) reported that in 1993 the World Bank estimated that about 40% of the people in this region live at less than 1US Dollar per day and that at least 59% of the poor live in five East African Countries and Nigeria.

Due to low standards of living for most rural coastal communities they are directly dependent on coastal and marine resources-the sea, intertidal marine systems and forests for survival and income generation. This state of the coast highlights the linkages between socio-economic well being and the environment. It is appreciated that forest ecosystem can be considered as natural capital from which goods and services can be provided from the natural environment. A decline in coastal ecosystem productivity has a direct negative impact on coastal communities. Hence, protecting environmental resources that people depend on for income generation and their very livelihood through participatory approach is critical to the survival of coastal families, poverty reduction and slowing down rural-urban migration (TCMP, 2001).

For quite sometime the management strategy of mangrove forests was based on top down approach. In the top down management approach local people have little control over the resources and invariably there is no multiple use policy incorporating commercial and traditional user interests. Due to the failure to control the resource, there has been a large commercial cutting of mangroves (Semesi, 1991). According to Kajembe (1997) the top down management approach creates a kind of institutional vacuum, which leads to open access regime. Under open access situation, degradation of forests is an expected outcome. In 1994 the Forest and Beekeeping Division (FBD) established the Mangrove Management Project (MMP) in 3 zones namely: northern zone, which includes Tanga, Muheza and Pangani Districts, central zone that includes Dar es Salaam Region, Kisarawe, Mafia and Rufiji Districts and the southern zone which encompasses Kilwa, Lindi and Mtwara Districts.

The new Tanzania Forest policy (URT, 1998) realizes the core problems in the management of both central and local government forest reserves. As the strategy to overcome the problems which are existing, the Forest Policy states that; “in order to improve forest conservation and management and to ensure equitable sharing of benefits among all stakeholders, Joint Forest Management (JFM) agreement between the central government, specialized executive agencies, private sector or local governments, as appropriate in each case and organized local communities or other organizations of people living adjacent to forest will be promoted”. The general guidelines for managing forest resource is to ensure sustainable supply of forest products and services by maintaining sufficient forest area under effective management.

1.2 Problem statement and justification

Recently human population in many areas surrounding forest reserve has increased rapidly. This means that demands focused on forests have increased to meet socio-economic as well as nutritional needs, as more local people demand land for cultivation and are poor and food insecure. Mangrove forests are the potential sources of fuel wood, building poles, material for boat making, beekeeping, ecotourism, fisheries production among others. All of these are important to the livelihood and income of coastal people. Despite the potentiality and resource richness of mangrove forests and their influence on the local community as well as national economies, these products have not received the desired attention in research, development, promotion, investment and planning. The available information on management of mangrove forests and mangrove forest products in relation to livelihood is still very scanty although mangrove forests contribute substantially to the rural people's well-being in coastal Tanzania.

Mangrove forest management is under the central government and management decisions had been top-down. This prevented local people from forest use and management aspects, creating misunderstandings between the owner of the forests (state) and local communities (users) hence increased abusive resources uses in the forest, illegal timber harvesting as local people saw that they were not part and parcel of the reserve. In 1994 the Mangrove Management Project (MMP) was initiated and intended to take into account participatory approaches to mangrove management. The demand for mangrove products prompted the need for JFM as a solution for sustainable utilization and conservation of mangrove ecosystems. Under JFM the owner of the forest is the government and the communities are

duty bearers and in the course of management processes tend to have cost and benefit sharing (Prassed, 1999). JFM aims at sharing of benefits, responsibilities, control and decision making authority over forests between the Forest Division and local user groups as an effort to ensure sustainable forest management and improved livelihoods (Higman *et al.*, 1999). JFM has been practiced in mangrove forest management for significant time period now but little if any is quantitatively documented on the contribution of mangrove products to the livelihood of adjacent local communities under JFM.

1.3 Objectives of the study

1.3.1 Overall objective

The overall objective of the study is to assess the extent to which mangrove products contribute to the livelihoods of adjacent communities in Tanga and Pangani Districts.

1.3.2 Specific objectives

The specific objectives are to:

- (i) Identify the existing and potential mangrove products that may be available to contribute to local people livelihoods and their uses and availability.
- (ii) Assess how accessible are the products to adjacent community.
- (iii) Assess the extent to which the products contribute to household income and other forest based goods.

This study answered the following questions: what are the products available for local use from the mangrove ecosystem and how are the products contributing to household income and other forest based products?

CHAPTER TWO

2.0 LITERATURE REVIEW

Mangroves are well known for their ecological role and high productivity. These forests comprise of several species of trees, some of which reach over 25cm in height, usually rooted in mud. Through the action of the roots these forests trap land based debris, sediments and suspended particulate matter carried to the coast by rivers. They are thus important for the health of near-shore ecosystems like sea grass beds and coral reefs that develop best in clear water (TCMP, 2001). Mangrove forests are extremely productive ecosystems that also function as feeding and nursery grounds for many species of fish, shellfish, prawns and crabs. Mangrove forests along the shoreline also provide important protection against ocean waves and currents and therefore coastal erosion. The trees themselves and the mud around their roots are important habitats to a variety of aquatic and avian life. At high tide hundred of fish species move to the mangrove forest to feed and to breed. Many fish and prawns rely on the mangrove as nursery ground for their young. Mangrove wood is very dense and therefore can resist termites and fungi.

Livelihood is defined as adequate stocks and flows of food and cash to meet basic needs. Livelihood implies a means of living (set of activities a human being apply to earn everyday life). A livelihood is much more than a job and it covers a whole range of activities people do to make a living which can include all aspects of life and well being, especially health and food security (Carney, 1998). According to Chambers and Conway (1992) a livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living. Sustainability of livelihoods rests on

environmental, economic, social and institutional dimensions, and hence an important facet if progress in poverty alleviation is to be lasting. Rural livelihood options in most DCs include farming (crop production and animal rearing), gathering, hunting, trading, craft making, and rarely public or civil services (Poku *et al.*, 2003). In Tanzania where rivers, lakes or ponds exist, fishing is an important source of livelihood to produce livelihood opportunities for the next generation and it contributes to net benefits of other livelihoods at the local and global level and in the long and short term. On the other hand most communities adjacent to forest resources in rank agriculture as the backbone of their income but due to low and unstable prices of agricultural products and also unreliable rainfall, farmers are forced to rely on other sources of income. Communities living in proximity to natural resources such as forests and wildlife will continue to rely (illegally or legally) on them for their livelihoods and for economic survival (Kaboggoza, 2000). Kahyarara *et al.* (2002) highlighted that, there is a profound and vicious cycle between poverty and deforestation around the gazetted forests. This implies that, economic status of any community adjacent to any forest resource has a direct impact on the resource. The majority of rural poor in the DCs rely on forests and woodlands for their livelihood because of low income and lack of other alternative means to support their subsistence. It is estimated that 80% of human population in East Africa live in rural areas and depend heavily on forest resources for their livelihood (World Bank, 2002). Tanzania like other DCs depends on her natural resources such as land, forests, wildlife, fisheries, water, minerals and other resources for development in which for thousands of years mangrove ecosystem has played an important role in the social and economic development for coastal communities. Today, this unique but fragile ecosystem is still the main provider of various useful products such as charcoal, poles, fish, tannin (TCMP, 2001). At commercial

level, mangroves are important items of trade and source of employment and income for coastal communities. Mangroves are cut for domestic fuel wood market and there is a demand for commercial fuel wood for the production of salt, lime and processing fish and coconut oil. Mangroves are source of raw material for artisans and boat builders. Fishermen use mangroves to make traps and floats for fishnets. Other species of mangroves are used for animal fodder, beekeeping and local medicines, which are very rare. Mangroves also provide opportunities for education, scientific research, recreation and eco-tourism (TCMP, 2001).

However in Tanzania for many decades natural resources have been controlled by the state with management policies being characterized by centralized decision-making processes. Well-defined land tenure and resource protection apply only on forest reserves that account for 30% of forested land while the remaining 70% (most of which are miombo woodlands) are under village and general lands (formerly known as public lands) with very little protection thereby creating more opportunities for over-exploitation.

The 1998 Forest policy and Forest Act (No. 14, 2002) are the paramount tools for forest resources management and use. Since 1986 Tanzania embarked on policy and institutional reforms whose overall objectives have been to restore the national economy. The following socio-economic objectives and policies were considered; to ensure macro-economic stability; to maintain an environmentally sustainable development path; to create and enable environment for a strong private sector; to reduce government involvement in productive activities; and to improve efficiency in the use of public resources (URT, 1998). A part from that the National Forest Policy advocated the need to

involve communities in the management of forest resources. Community participation means that people organize themselves, accept responsibilities and become involved in local decisions (Sholz, 1997). Participation of a community will not be sustained unless technical solutions are effective and meet the need of the particular society. In Tanzania participation of coastal people is of paramount importance for the success of the management of the mangrove resource. Only if it is an asset to them they will defend it against illegal exploiters. Throughout the history, local people have been isolated from main streams of economic and political life and they feel dis-powered in shaping the decision that affect their lives. They have also little control over the very resources they are essentially managing. Sustainable Forest Management is a subset of sustainable development. Higman *et al.* (1999) defined sustainable development as development that is economically viable, environmentally harmless and socially beneficial and which balances present and future needs. Sustainable forest management is defined as the process of managing forests to achieve one or more clearly specific objectives of management with regards to the production of a continuous flow of desired forest products and services and hence livelihood improvement without under reduction of its inherent values and future productivity (Higman *et al.*, 1999). Therefore it involves the achievement of multiple management objectives. Forests have economic, environmental, social and cultural roles, from the country and particularly for the local communities. The mangrove forests for instance need to be protected from destructive and illegal activities which are incompatible with the objective of sustainable forest management. JFM is the strategy used in management of forest reserves including mangrove forests in Tanzania. JFM is an outgrowth concept of Collaborative Forest Management. The consistent features are partnership between different interested parties. As stipulated in the National Forest Policy

of Tanzania, by 1998 the government had started working out modalities of using specialized executive agencies to manage some of the forest on behalf. In JFM the right holder is the government (central or local) and the communities are duty bearers and in the course of management process tend to have their benefit shares and cost (Prassed, 1999). JFM is included in PFM which is an umbrella which attempts to secure and improve the livelihoods of local people dependants on forest resources (Hobley, 1996), by involving all key stakeholders in the process of forest management, understanding their needs and situations, allowing them to influence decisions and receive benefits and increase transparency. PFM programmes have been used in several DCs in order to resolve some misunderstandings between the government as forest owner and local communities as users, for purpose of attaining livelihood for forest adjacent communities and forest management. PFM is a strategy to achieve forest management by encouraging management or co-management of forest and woodland resources by the communities living closest to them, supported by a range of other stakeholders drawn from local government, civil society and the private sector. PFM in Tanzania has three principal objectives, to maintain or enhance forest quality and condition, to enhance local livelihoods through increased forest revenues and supply of subsistence forest products; to establish or strengthen effective and representative village NRM institutions. The livelihood would be attained as poor communities with limited resources and income will see something tangible in relatively time. Also the communities will become more willing to participate in mangrove conservation activities due to the presence of tangible benefits as in most cases, villages are allowed to collect minor forest products such as fuel wood, non timber forest products and the like. For the mangrove forest to function as livelihood and incentive, the access and the use rights should provide more tangible economic

benefits to people. Thus in other words JFM reverses top down, center driven management strategy by focus on the people who bear the cost of conservation. The deeper agenda for contemporary foresters in Tanzania is to make forests and forest products meaningful to rural communities. As far as local communities are concerned, the agenda to regain control over forest resources and through collaborative management strategies, improve their economic well-being and livelihood.

Tanzania Development Vision (TDV) 2025 provides the guiding framework for forest policy and several other policies. The vision is for Tanzania to move from a LDC to a middle-income country by 2025, with a high level of human development. Specific targets include: a high quality livelihood, which is characterized by sustainable and shared growth (equity) and freedom from poverty, good governance and the rule of law, and a strong and competitive economy capable of producing sustainable growth and shared benefits (TDV 2025, 2001). Along with this vision is the PRSP, supported by the NPES, which sets out Tanzania's Strategy and objectives for poverty eradication by 2010. The key priority areas for achieving poverty reduction include: reducing income poverty through equitable economic growth, improving human capabilities, survival and social well being, and containing extreme vulnerability among the poor (URT, 2000).

CHAPTER THREE

3.0 MATERIALS AND METHODS

3.1 Description of the study area

3.1.1 Location and climate

The study was conducted in Tanga and Pangani Districts. Geographically the two districts lie between 38⁰8' and 39⁰ 1' E and 4⁰ 8' and 5⁰ 8' S, North Eastern Tanzania. This study was done only to villages along the coast and adjacent to mangrove ecosystems. The study area is characterized by tropical conditions with relative humidity of about 96% during daytime and 76% at night. Temperature ranges between 18°C and 35°C, while rainfall is between 1100 and 1900 mm (TCMP, 2003). A large part of the coastal area experiences two rain seasons in a year, short rainy (Vuli) season between November and January and long rainy (Masika) season between March and May.

KEY:

Figure : Location of the study area.

Source: URT (2005)

3.1.2 Vegetation and soil

Natural vegetation of the coastal area is mainly shrubs, scattered trees and mangrove forests. The mangrove forests are found in deltas of the coastal area with varying status and qualities. Baobab trees, palms, cashew nuts and varieties of indigenous tree species are common along the coast. The vegetation around the villages/settlements is usually degraded compared to those away from the villages. The soil of the areas is predominantly sandy and coralline with poor moisture holding capacity.

3.1.3 Socio-economic activities

More than half of the population depends on agriculture. Important food crops are maize, cassava, sweet potatoes, cowpea, and rice while coconut, cashew nuts, mangoes, banana and sisal are sources of cash income. Most of the economic activities in the area are at subsistence level. Most men in the coastal areas are fishermen while women and children are collectors of inter-tidal mollusks, fish and prawns. These products are important source of income to both fishermen and those engaged in processing and trading. Seaweed cultivation has rapidly emerged as another cash crop in the coastal area especially for women.

3.2 Data collection

3.2.1 Research design

A cross-sectional research design was used in this study. This method allows data to be collected from different groups in time. The design has greater accuracy and provides quick results (Bailey, 1997). This method is considered to be useful because of limitations in time and financial resources. The population from which the sample for this study was

drawn was from local people living in villages adjacent to mangrove forest reserve in Tanga and Pangani Districts. Two villages in each district that are nearby the mangrove forest reserve were involved in the exercise. Those villages were Chongoleani and Machui from Tanga District and West Pangani and Kipumbwi in Pangani District. Random sampling technique was employed in selecting household for interview. A household for this study was a sampling unit. According to the World Bank (2002), a household is defined as the number of people who dwell or live under the same roof and share the same bowl. Household samples were picked from the village register (sampling frames) out of which 12% of households were selected randomly. According to Kajembe and Luoga (1996), significant population representation is attained when a random sample of at least 5% of the total households is taken from the population.

3.2.2 Primary data collection

The primary data were collected based on formal interviews by structured questionnaires to local communities adjacent to mangrove forest and focus group discussion to fishers, seaweed farmers, beekeepers and salt miners associations.

Structured questionnaires (Appendix I) containing both open and closed ended questions were used whereby respondents were required to provide their own answers pertaining to types of products from mangrove ecosystem and their uses, quantities and prices of different products, household income from mangrove products and other forest based goods. A total of 120 households were interviewed. To ensure validity and reliability, the questionnaires were pretested in one village (Chumvini in Tanga District) and 30 households were interviewed. Necessary changes were made on the basis of pre-testing

results before administering the final questionnaires. This includes restructuring of and omission of some question which seemed invalid from the questionnaire pre-testing. The village used in the pre-testing was not involved in the main survey.

A checklist was used to obtain information from key informant. A key informant is an individual who is accessible, willing to talk and has a depth of knowledge about issues in the study site. Key informants are not only members of the clientele, but are most often informed outsiders (Mettrick, 1993). For this study an open-ended discussion was conducted with the mangrove management officer, village extension or forest officers and village leaders or government officers (See Appendix 2).

3.2.3 Secondary data

Published and unpublished information, project documents, Sokoine University of Agriculture National Library (SNAL) and relevant websites were used to collect secondary data that gave information and issues related to the study.

3.3 Data analysis

Both qualitative and quantitative methods were used to analyse the data. Participatory Rural Appraisal data were analysed with the assistance of local communities and the information obtained was communicated back to them for verification. Unstructured questionnaires (qualitative information) were analysed using content and structural-functional analysis to get meaningful parcels of information from the verbal communications. Content analysis is a set of methods for analyzing the symbolic content of any communication. The basic idea is to reduce the total content of communication to

some set of categories that represent some characteristics of research interest (Singleton *et al*, 1993). Through this method, the data collected through verbal discussions with key informants was analysed in detail whereby the recorded dialogue was broken down into smallest meaningful units of information or themes and tendencies. According to Kajembe and Luoga (1996), the technique helps the researcher in ascertaining values and attitudes of the respondents thereby generating themes and tendencies. Structural-function analysis helped to distinguish between visible and hidden functions. Visible functions are those consequences which are intended and recognized by the actors in the systems while the hidden functions are those consequences which are neither intended nor recognized by the actor.

Data obtained from questionnaires were edited, summarized, condensed, coded from the questionnaires, and analyzed with Excel and Statistical Package for Social Science (SPSS) computer programmes were used to generate descriptive statistics in the form of tables, frequencies, charts and percentages.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSIONS

4.1 Characteristics of respondents

The socio-economic characteristics of the respondents considered included sex, education level, marital status, age and main occupation.

4.1.1 Sex and marital status of respondents

As shown in Table 1, 56% of the respondents were females, while 44% were males. This implies that the females had a larger representation to be interviewed since they were found at home during the study. This is a typical characteristic of most coastal African societies in which women are left at home doing household activities. Semesi (1991) reported that, compared to women of other regions of Tanzania those of the coastal villages are more confined to their houses. The number of women in the villages is considerably higher than that of men. This may be probably due to outward migration of men who usually bread seekers. This result is similar to that done by Semesi (1991) in Rufiji as he found that the outward migration of men was higher nearer Dar es Salaam, in Bagamoyo and Rufiji. As a consequence many women are left permanently or temporarily alone with the burden of agricultural work and rearing of children. About 65% of respondents were single, 33% of the respondents were married and 2% were divorced. However, both married and unmarried respondents represent the mature people as far as the household head is concerned. By implication, marital status underlines the degree of responsibilities pertinent to household management. The use of resources to generate households' income is either directly or indirectly influenced by marital status. In relative

terms, married couples have additional responsibilities in maintaining their livelihood through provision or supply of food, clothing and housing, which are fundamentally the basic needs or requirements to every human being. Semesi (1991) showed that the main ethnic groups living in the villages along the coast are the Swahili and majority of whom are Moslem in which the number of polygamous household is low, but the divorce and remarriage rate is very high.

4.1.2 Age of respondents

About 26% of respondents were of age below 30 years, while the majority of respondents (59%) were of age between 31 and 56 years, and 15% of respondents were of age above 56 years of age (Table 1). This implies that most of the people in the study were in economically productive age group, as the age above 56 years is considered less economically active because the members are too old though they might be important in guiding the young generation in regard to resource management. Mayetta (2004) reported that older people have indigenous knowledge with regard to forest management and values after using them for decades. Thus they can be resourceful in guiding the young generations on the cultural practices to protect and manage natural resources.

4.1.3 Education level

The study revealed a high number of respondents (51%) with primary education (Table 1). On the other hand 31% of respondents had no formal education, 11% of respondents had secondary education, and 6% of respondents had other specifications like Q'uran and 1% responded to have college education. The results show that majority of the respondents attained primary education as the highest level of education. With this level of education it

further implies that majority of respondents are knowledgeable regarding management and utilization of mangrove products, since they are able to read and write. It is therefore easy for them to be trained on management of natural resource. Education level reflects the capability of a society in terms of human capital as a livelihood asset and is normally associated with increasing understanding of the broad benefits accrued from conservation of natural resources. Katani (1999) argued that an increase in education level increases the level of awareness and thereby creating positive attitudes, values and thereby motivating people to manage natural resources sustainably since increasing education levels usually increases people's awareness of the value of the resource hence imparting a positive perception of conservation initiatives. Mbwambo (2000) argued further that people who are better educated tend to plant more trees for different uses at their homesteads as opposed to less educated ones.

4.1.4 Occupation

The study shows that farming is one of the major economic activities in the study area (Table 1). About 31% of the respondents were engaged in different food and crop production. Results show that 22% of the respondents did fisheries and 21% were petty traders. This implies that majority of the coastal people depend on agriculture and fishing for their household food and income. Semesi (1991) elaborated that the economy of the coastal people combines fishing, agriculture, trade and handicrafts in which most women and men are farmers and the main food crops are rice, sorghum and cassava in which coconuts are becoming an alternative cash crop. Men in coastal areas are fishermen in which fish and prawns are important sources of income. Opportunities for employment and other income generating activities not related to fishing are few. Other segment of the

society is therefore engaged in utilization of the mangrove ecosystems including cutting mangrove poles, making salts, burning lime. All of these products are associated directly or indirectly with mangroves. Gorman (1995) stipulated that about 150 000 people live in coastal villages of Tanga and rely on a number of activities to maintain the household economy of which artisanal fishing and farming are the most important activities.

Table : Characteristics of respondents in communities adjacent to mangrove ecosystems in Tanga and Pangani Districts, Tanzania.

Characteristics	Percentage (%)
Sex	
Male	44
Female	56
Marital status	
Married	33
Single	65
Divorced	2
Age class years	
Below 30	26
Between 30 and 56	59
Above 56	15
Level of education	
Illiterate	31
Primary	51
Secondary	11
College	1
Other specifications	6
Occupation	
Farmer	31
Fisher	22
Employed	3

Petty trader	21
Others	23

4.2 Products obtained from mangrove ecosystem

The study further revealed several products are available and accessible to communities adjacent to mangrove ecosystems (Table 2). Firewood was ranked high (53%), followed by mangrove poles (31%), fish (14%), and bee products like honey and crabs (1%). This implies that many people in the surveyed villages tend to rely on accessible mangrove forest resource in their livelihoods. Munishi *et al.* (2002) and Munishi *et al.* (2004) stipulated that rural communities in Tanzania depend on forests for a multitude of services and products and the forms in which people benefits from the forest range from use of forestlands as food sources, sale of products from the forest, to small processing enterprises based on raw material from the forest. According to Njana (1998) communities living close to natural resources such as forests and wildlife will continue to rely (legally or illegally) on them for their livelihood and for economical survival. Semesi (1991), in his study in Rufiji Delta found that mangroves are an item of trade and source of employment and income for the delta communities. The wood is used as fuel for commercial production of salt, lime and for the processing of fish. Mangroves are the source of domestic fuel wood and of raw material for artisans, boat- builders and beekeeping which are minor activity. Fisheries and prawn catch in particular depend on intact mangrove ecosystems. Mangrove forests were described to be important sources of poles used locally for building material as well as for export market. On the other hand the cutting of mangrove trees can result into erosion of the gene pool for the species harvested and may increase pressure on their use thus causing severe environmental consequences.

Mangroves are the habitat for a variety of invertebrates, such as crabs and mollusks which are harvested on a small, non-commercial scale but which nevertheless are very important source of protein in the diet.

Table : Responses on mangrove products accessed and obtained from mangrove ecosystem in Tanga and Pangani Districts.

Mangrove products	Frequency	% Respondents
Firewood	70	53
Poles	40	31
Fish	18	14
Beekeeping	2	1
Crabs	1	1

Figure : Mangrove products accessed and obtained from mangrove ecosystem in Tanga and Pangani Districts.

4.3 Use right and access to some mangrove products and services

Table 3 shows that 53% of the respondents agreed to have use rights and access to some forest products and services from the mangrove forest while about 47% claimed to face some difficulties in accessing the resources, due to bureaucracy and poor downward management communication mechanism within the village councils. Giving rights and access to the poor can be regarded in itself as a means to improve livelihood which is the main goal of PFM in forest reserves. FAO, 2001 stipulated that the right and capabilities of local communities to access, control and use forest products are contributing to livelihoods. Similar observations were also made in Kwizu Forest Reserve and Duru Haitemba whereby villagers are satisfied with the products they collect from the forest (Kajembe *et al.*, 2004). On the other hand Kigula (2006) pointed out that, stakeholders adjacent to East Usambara forest are not fully empowered in managing the forest resulting into poor access, control and use of the resource and reduced chances to explore potentials for PFM to address poverty and enhance livelihoods.

Normally forests on general lands are protected and no body is allowed to enter the forest to harvest trees or access other products without a license. In order to control mangrove ecosystem degradation some control measures have been instituted including permits for accessing the products. Majority (57%) of the respondents obtain permits from the village environmental committees while others get permits from the district mangrove office (Table 3). It was learnt that the District Mangrove Officer (DMO) is the officer responsible in issuing permits while the village environmental committees act as link between local communities and the DMO. The villagers find this permitting system to use mangrove

resources too bureaucratic and inconvenient and that large, commercial users get preference over their own needs.

All mangroves are gazetted and are under the authority of central government as reserves though small scale utilization can be allowed under permits issued by the DMO (Nurse, 1997). On the other hand under participatory forest management which aims at more sustainable forest management, local institutions especially the village environmental committees are key players linking people to government officers and sometimes acting to safeguard the resources from unplanned or illegal use.

About 66% of the respondents reported to have limited access to the mangrove products, 30% reported to access the mangrove products anytime they were in need while 3% reported to have access only during dry season. For those who had limited access it was due to the fact that, part of the forest which has been over exploited is now closed for regeneration and people are allowed to collect mollusks, crabs, only dead mangrove trees for firewood.

Table : Response on use right and access, permit issuing institutions for access of mangrove forests and allowable access time in Tanga and Pangani Districts, Tanzania.

Response items	Frequency	% Respondents
Access/ Use right		
Have access	64	53
Have no access	56	47
Permit issuing institutions		
Environmental committee	38	57
Mangrove Office	23	34
Illegal	6	9
Allowable Time		
Limited access	77	66
Anytime	35	30
During dry season	4	4

4.4 Trade and market for mangrove products

About 57% of respondents reported to use the mangrove products they collect solely for home consumption. On the other hand a good proportion (43%) sale the products they collect. However there are bylaws that restrict commercial exploitation of mangrove forest reserve as they are reserved for environmental conservation and other non commercial benefits thus constraining free trade in mangrove products. The study revealed however that for those who have been engaged in trade with mangrove products, majority (72%) reported that there is substantial market reliability for the products (Table 4). They further reported that the market of products like mangrove poles, fish are both export and local

market, while markets of firewood and bee products were reported to be inter-household. Semesi (1991) reported the mangrove products at commercial level to be an important item of trade and source of employment and income for the coastal communities. This is similar to other forest areas for instance CANARI (2002) reported that, in the Caribbean, livelihoods of people who depend on forest resources have become more secure as a result of better managed forests (whose products can be sold at a higher price), increased skills, and the exclusion of competitors. Also in West Bengal India, studies have shown that PFM has led to an increased availability of fuel wood and that; communities derive as much as 17% of their annual household income from NWFP collection and sale (Tewari and Campbell, 1995).

Furthermore the study revealed that although a significant number of the respondents (43%) do pay for the mangrove products collected, majority (57%) collect mangrove products for free. For those who paid, the average cost for a license to collect the products was 80 000 Tshs (US\$ 64) per year.

Table : Trade and marketing of mangrove products in Tanga and Pangani Districts, Tanzania

Responses	Frequency	Percentage (%)
Sales of Mangrove products		
Have sold mangrove products	40	43
Have not sold mangrove products	54	57
Markets		
Reliable	86	72
Not reliable	33	28

4.5 Current status of available mangrove forest and related products and level of local people dependency

Table 5 presents the status of available mangrove forest and related products now as compared to 10 years ago based on respondents views. Majority (54%) of the respondents observed a fluctuating supply with no clear trend while a good proportion (23%) observed that the supply has been decreasing. On the other hand almost equal proportion of the respondents observed mangrove products to have increased or remained unchanged.

The level of dependency on mangrove ecosystems by the local people is seen to be moderate by majority of the population (48%). This may be an indication that utilization pressure on the mangrove resources has been relatively moderate and less degrading which has maintained the resources in a state that ensure constant supply of products from the ecosystem. On the other hand it may as well be a question of proper law enforcement that prevents deterioration of the ecosystem. According to Ascher (1995), a community living near a resource and depending on it for livelihood, and knows that it will enjoy the benefits of the resource for a long time, is more likely to refrain from misusing it. People settled in one locality which they call home, will use a resource more carefully because if they deplete it they have nowhere else to go. They are different from a commercial corporation, which is always on the move, and depletion of resource in one place means moving to another place and continuing with the same trend.

Table : Current status of mangrove forest and available products and the level of local people dependency on the ecosystem in Tanga and Pangani Districts, Tanzania

Responses	Frequency	Percentage (%)
Availability		
Fluctuating	62	54
Decreasing	26	23
Increasing	14	12
No change	13	11
Level of dependency		
Moderate	57	48
Very low	25	21
Low	17	14
High	11	9
Very high	10	8

Figure : Current status of available mangrove forest and related products in Tanga and Pangani Districts, Tanzania

Figure : Current level of dependency on mangrove forest and related products in Tanga and Pangani Districts, Tanzania

4.6 The contribution of mangrove products to household income

Despite the fact that moderate local people dependence on the mangrove ecosystem, males responded to earn average income of about 1 704 000 Tshs (US\$ 1364) per year and females earned average income of about 3 027 000 Tshs (US\$ 2422) per year from trade in mangrove products such as fish, poles and crabs. It was further reported that this income from mangrove products would have been higher if it were not for limited capital, low education level, poor equipment and instability in markets at times or in different seasons. On the other hand the average income from other source of income such as selling salt, cultivation of crops (cassava, maize, banana, sweet potatoes), tailoring and livestock keeping (cows and goats) which indirectly associated with mangroves was significantly

lower than that obtainable from mangrove products, in which males reported to earn 1 058 000 Tshs (US\$ 847) per year while females reported to earn 958 900 Tshs (US\$ 767) per year. The results show that mangrove products contribute much more to the income of the local people in the study area than other sources. This implies that local people adjacent to mangrove ecosystem depends more on mangrove products for income and livelihood, this is different from other studies elsewhere (Kilahama and Massao, 1999), (Mialla, 2002), (Kaale and Mshana, 2004) who reported that the main economic activities of the communities adjacent to Monduli Forest Reserve are livestock keepers and peasants. But Munishi *et al.* (2004) observed that about 66% of the population of Tanzania earn about 15% of their household income solely from forestry and forestry related activities.

Table : Earning by family members from the sale of mangrove products and from other sources per year in Tanga and Pangani Districts, Tanzania

Member	Source	Minimum (Tshs)	Maximum (Tshs)	Mean (Tshs)
Males	Mangrove	10 000	9 000 000	1 704 000
	Products			
	Other Sources	5000	6 000 000	1 058 000
Females	Mangrove Products	11 000	20 718 000	302 700
	Other Sources	30 000	600 000	958 900

4.7 Other income generating activities practiced in mangrove ecosystems

4.7.1 Aquaculture

Aquaculture forms an important activity for income and livelihood security of many communities of the coast. This study shows that 13% of all respondents acknowledged practicing aquaculture (Table 7). The major species involved in aquaculture are fin fish, prawns, crabs and oyster. Crabs were reported to be cultivated by majority of the population. The respondents failed to mention the income owned from aquaculture as they were just started to cultivate.

4.7.2 Seaweed farming

About 10% of the population do practice seaweed farming (Table 7). Seaweed farming is however is not seen to be very prominent probably due to poor markets and hence low prices for the product (140 Tsh. per kilogram) compared to the expenses of the growing the crop. Such a situation may on the other hand be caused by low awareness on the crop leading to low consumption and poor markets.



Plate : Seaweed farming practice at Kipumbwi Village, in Pangani District

4.7.3 Salt production

Salt making has been one of several activities done by coastal people in improving their livelihood. The local people use mangrove trees for firewood in boilers for salt production. In response to these ongoing threats to the mangrove ecosystem a number of conservation initiatives have been undertaken. Restriction in using firewood in salt production is one of the initiatives. Due to this restriction, investors use salt pans which rely on solar energy for evaporation though it needs high capital and costly to run. The study revealed that 98% of the respondents did not own salt production enterprises as it is a less significant activity for them to invest, instead they are employed in salt making enterprises which use solar energy for evaporation and they are paid in wages. Employment is an income earner to a household and thus a contributor to financial capital as livelihood asset and thus poverty alleviation.

4.7.4 Beekeeping

Beekeeping for honey and bees wax production is a recently established initiative practised in the mangrove forest reserves by villages adjacent to the forest, for income generation and food supply. This initiative is aimed at non consumptive use of the mangrove ecosystem under PFM and communities are given beehives for free. This strategy also is aimed at sustaining the activity as it builds the sense of ownership to the concerned beekeepers. Despite beehives being offered for free only 5% of all the respondents were engaged in beekeeping practices with a total of 1105 beehives. This is not surprising as the initiative is quite new and may likely build up as people become aware. Furthermore it might be stimulated by prices of above 2000 Tshs (US\$ 1.6) per litre of honey and about 250 Tshs (US\$ 0.2) per kilogram for beeswax. Meanwhile honey were

not yet produced but respondents reported that they were expecting to get about 7735 litres of honey and 800 kg of beeswax in the year 2007, which will give total income of about 15 670 000 Tshs (US\$ 12 536). This implies that if more people will be motivated to beekeeping their income will increase much more. This can be supported by the study done in Cuba by FAO (1994) which showed that about 25% of the annual honey production in Cuba (Some 8000 - 10 000 tonnes) is derived from mangrove ecosystems.



Plate : Beekeeping practice in Mangrove forest at Machui village, in Tanga Districts.

Table : Responses on other income generating activities in mangrove ecosystem in Tanga and Pangani, Tanzania

Responses	Frequency	Percentage (%)
Is there any family member practicing aquaculture?		
Yes, there is	15	13
No, there is no	105	87
Which species do you farm?		
Fin fish	10	8
Prawns	5	4
Crabs	27	23
Oyster with crabs	78	65
Is there any family member doing seaweed farming?		
Yes, there is	12	10
No, there is no	108	90
Reasons for not practicing seaweed farming		
Lack of Capital	9	7
Low price	19	16
Poor awareness	14	12
Other reasons	78	65
Marketing		
Reliable markets	11	9
unreliable markets	109	91
Do you own a salt production enterprise		
Yes, I own	2	2
No, I don't own	118	98
Do you practice beekeeping		
Practice beekeeping	6	5
Not practice beekeeping	114	95
Number of beehives owned		
0	114	95
1-200	4	3
> 200	2	2

4.8 Study limitations

Several limitations were encountered during the study including:

4.8.1 Willingness of respondents to be interviewed.

This study was under taken in four villages which are along the coastal area where a number of respondents were Muslims who were unwilling to spend their time being interviewed as they were fasting as per Islamic Pillars – Ramadan. This problem was solved by the assistance of a village chairman and a well-experienced extension staff to get the required information. Some respondents refused to give information because they had not seen any outcome as far as previous researches are concerned. They argued, “we benefit nothing by answering questions”.

4.8.2 The problem of keeping records

Data related to income per household were a big limitation because of failure of respondents to keep records and to recall memory. The experience of village chairman was instrumental in overcoming this problem.

4.8.3 Poor accessibility

Some areas were not easily accessible due to transportation, floods and geographical locations. The researcher and assistants spent a lot of time walking on foot from one village to another during data collection instead of using reliable transport such as motorcycle.

4.8.4 Wrong perception of the study

Some respondents were not open to answering questions particularly those question involving their welfare. Consequently some questions were either not answered or not answered properly and some of the questions were answered after long explanations, expressions or discussion.

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The following conclusions are made from the findings of the study:

- a) The local communities adjacent to mangrove ecosystem depend much on mangrove ecosystem as they obtain some mangrove forests products which are used for home consumption and for commercial purpose, in order to improve their income and hence improving their livelihood. Firewood was reported to be a major product; other products were mangrove poles, fish, crabs and bee products like honey and gums.
- b) People in the study area reported to have use rights and access to some forest products and services though there are some difficulties in these benefits due to bureaucracy of leadership or poor mangrove management and communication mechanism within the village councils. The District Mangrove Officer (DMO) was reported to be responsible in issuing permits to use mangrove resources.
- c) Income as a financial capital in relation to livelihood, the study revealed that mangrove products contribute significantly to the household income of local communities in which males earned average income of 1 704 000 Tshs while females earned average income of 3 027 000 Tshs per year, on the other hand people earn the average income from other sources in which 1 058 000 Tshs per year was earned by males and 958 900 Tshs per year was earned by females. Furthermore some villages reported to involve themselves in other IGAs like

aquaculture, seaweed farming, salt production and beekeeping practiced in mangrove ecosystem which are alternative to consumptive use of mangrove ecosystem.

5.2 Recommendations

Based from the conclusions, below are some pertinent recommendations for the study findings:

- a) The Village Executive Officer (VEO) with the help of environmental committee and DMO should be given the mandate of giving permits to use rights and access to forest products and services in a sustainable manner. This will help to improve income and hence livelihoods as the problem of bureaucracy, poor management and communication will be reduced.
- b) NGOs, donor agencies and government institutions should give more emphasis on alternative IGAs like planting of coconut palms which is an alternative to mangrove trees. Coconut palms can be used in fuel wood, timber, charcoal making, fences, and poles for house construction, boat building and medicine. Seaweed farming should also be emphasized as currently few people are involved because of low market and price. Also the government should employ expertise such as through consultations, yield will be increased, and in so doing many people will be motivated to engage in. In view of the results in this study, it is also recommend that free training through seminars concerning beekeeping will help people to become aware and provision of beehives will increase production of honey and beeswax. Other activities like aquaculture of crabs, oyster to mention few should be emphasized. All these activities will slow down destruction and improve the

conservation of mangrove ecosystem around coastal areas and hence improve income and livelihoods.

- c) In order to improve livelihood and household income to local communities adjacent to mangrove ecosystem, there is necessity of increasing availability of mangrove products by motivating them in improving management, commitment, ownership, and interest to conservation of mangrove ecosystem to ensure sustainability.
- d) More researches on mangroves should be done and the results obtained should be disseminated to public.

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APPENDICES

Appendix : Household questionnaires

Please, you are kindly asked to provide sincere information on the following questions. All information provided will strictly be treated confidentially.

A: Household particulars

- 1.1 Name of interviewer
- 1.2 Village name
- 1.3 Ward.....
- 1.4 District.....
- 1.5 Name of respondent.....
- 1.6 Respondent's identification number.....
- 1.7 Sex(M/F)
- 1.8 Age ...
 - a)..... (21-30)
 - b)..... (31-40)
 - c)..... (41-50)
 - d)..... >56
- 1.9 Marital status
 - a) Single
 - b) Marriage (....)
 - c) Divorced
 - d) Widow

1.10 Education level

- a) Illiterate
- b) Primary (....)
- c) Secondary
- d) College
- e) Other specify

1.11 Household head

- a) Male
- b) Female (....)

1.12 Main occupation

- a) Farmer
- b) Fisher (....)
- c) Employed
- d) Petty trader

B. Products obtained from mangrove ecosystem

1.1 What products and services do you get from the forest?

Mangrove products	Consumptive value (subsistence)	Productive value (Goods for sale)	Non consumptive /indirect benefits	Optimal value and existence value

1.2 How do you access the products and services?

a) Permission

b) Free (....)

c) Illegally

1.3 If through permit who offers the permit?.....

1.4 Do you have to pay for the forest products you collect from the forest?

Yes/No

If yes, how much do you pay?.....

1.5 Do you sale some of the products you collect from the forest? Yes/No

If yes, how is the market?

a) Very good

b) Good (....)

c) Poor

d) Very poor

1.6 How do you get mangrove poles?

a) No permit

b) Permit but free (....)

c) Permit with payment

d) Free with no permit

1.7 What is the status of availability of the mangrove and related product now as compared to 10 years ago?

Availability	Wood products	Bee products	Fisheries products	Sea weed	Salt production	Others
Increase						
Decrease						
No change						

C: Family income generating sources

1.1 Main occupation

- a) Farmer
- b) Fisher (....)
- c) Employed
- d) Petty trader

1.2 How much is earned by each member of the family from the sale of mangrove related products per year?

Products	Father	Mother	Sons	Daughters	No people involved	Total income
Poles						
Logs						
Fuelwood						
Bee products						
Fish						
Seaweeds						
Prawn						
Salt						
others						

1.3 What is your level of dependence on the mangrove ecosystem?

- a) Very high

b) High (....)

c) Moderate

E. Income generated from other sources

1.1 What are the other sources of income?

1.2 How much do you earn from each source per month? (put answers in the table below)

Sources of income	Quantity obtained	Cash generated per quantity	Income per month	Total income per year
Total				

1.3 What is the reason for your current income to be at this level?

.....

D. Existing livelihood potential not full utilized

1.1 Which mangrove related income generating activity you and or your family practices?

- a) Beekeeping b) Seaweed c) Fish farming d) Forest harvesting (....)
- e) Selling marine related products f) Salt production

1.2 Which fish species associated with mangrove ecosystem?

List them.

1.3 is there any member of your family practice aquaculture. Yes/No

1.4 If the answer is yes which species do you farm.

- a) Fin fish
- b) Prawn
- c) Crabs (....)
- d) Oyster

1.5 Do any member of your family practice seaweed farming. Yes/No.....

1.6 If the answer is no why?

- a) Lack of capital
- b) Low price (....)
- c) Conflict between resources user
- d) Poor performance of the grown species

1.7 How is the market situation Reliable/ not reliable

1.8 What is the average price per Kg

1.9 Do you own salt production farm. Yes/No

Name of farm	Area	No of employees		Production kg/year	Income/year
		Permanent	Casual		

1.10 What was the establishment cost?.....

1.11 Do you practice beekeeping Yes/No.....

1.12 If yes, how many beehives do you have.....

1.13 How much was produced last year?.....litres of honey andkg of bees wax.

1.14 What was the price for each product.....Tshs/litres andTshs/kg of bees wax.

1.15 Where do you hang your hives?.....

Appendix : Checklist for key informants

A. Village extension/forestry worker

1. What are the general conditions of the forests/wood lands?
2. What can you comment on availability of mangrove products?
3. What are environmental strategies to ensure availability of mangrove products?
4. What are the important mangrove products you know?

B. Village leaders

1. What is the population of the village?
2. Involvement of local communities in mangrove ecosystem management.
3. Existence of mangrove management plan and management agreements.
4. Cost-benefit sharing arrangement between village and FBD.
5. Existing livelihood options both mangrove and non mangrove related.
6. Policy and regulation as regards to the use of mangrove ecosystem resources.
7. Effectiveness of the law enforcement in dealing with illegal activities.
8. Revenue from the harvesting or any use of the mangrove ecosystem resources.
9. Impact of donor funded conservation project working in Tanga and Pangani.

C: Regional Natural Resource Officer

1. Regional strategies on the use of natural resources for poverty reduction.
2. Region investment opportunity as regard to coastal tourism.
3. Comments on the capacity and performance of the institutions working in the districts.