STAKEHOLDERS' DIVERGING INTERESTS AND EMERGING RESOURCE USE CONFLICTS IN APICULTURE IN WEST USAMBARA MOUNTAINS, TANZANIA.

BY

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A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN LAND USE PLANNING AND MANAGEMENT OF SOKOINE UNIVERSITY OF AGRICULTURE. MOROGORO, TANZANIA.

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ABSTRACT

The study was conducted in West Usambara Mountains, Tanzania to assess stakeholders diverging interests and emerging resource use conflicts in apiculture with respect to natural resource management (NRM) by local communities. The study aimed at generating knowledge base for effective governance of NRM by farmers and draw lessons for guiding NRM efforts in the study area. Participatory Rural Appraisal, GIS, focused group discussion; questionnaire survey and participant observation were the methods used in data collection from 98 respondents randomly selected. Data collected were analysed using descriptive and inferential statistical analyses. The study identified five major land use types of which mixed cultivation and settlements is dominant (75.74%), associated with severe degradation of forest resources largely attributed to community's socio-economic divergent interests. With regards to apiculture, the majority of individual small scale farmers (73%) were driven by socio-economic interests than NRM. On the other hand, farmers' groups (10%) showed high interest in both economic and conservation of natural resources followed by faith based organisations (FBOs) (7%). Stakeholders' diverging interests in apiculture were significantly influenced by educational level ($p=0.010$); household size ($p=0.006$); marital status ($p=0.011$) and major economic activities ($p=0.029$). The most prevalent conflicts in the study area were between farmers practising apiculture and fellow farmers (74%) followed by neighbours (16%). The identified resource use conflicts in apiculture were significantly influenced by the level of interest ($p = 0.025$) and age ($p = 0.032$) of the respondents at $p<0.05$. The study demonstrated that for small scale farmers to engage in NRM, economic interest is vital. The study recommends that efforts should be directed towards promotion of

apiculture as an economic incentive for sustainable NRM. A stepped up and focused approach for mobilization of small scale farmers as beekeepers coupled with establishment of a coordinated framework for NRM is strongly recommended.

DECLARATION

I, JOY SINYANGWE, do hereby declare to the senate of Sokoine University of Agriculture that this dissertation is my original work and that it has not been submitted for a higher degree at any other institution.

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LIST OF ABBREVIATIONS AND SYMBOLS

ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
BDP	Beekeeping Development Programme
BINP	Bwindi Impenetrable National Park
CA	Content Analysis
CBFM	Community Based Forest Management
DALDO	District Agriculture and Livestock Development Officer
DBO	District Beekeeping Officer
DNPWLM	Department of National Parks and Wildlife Management
EMA	Environment Management Act
FAO	Food and Agriculture Organization of the United Nations
FBD	Forest and Beekeeping Division
FD/IRDP	Forest Department/ Integrated Rural Development Programme
FGD	Focussed Group Discussion
GIT	Geographical Information Technology
JMB	Joint Management of Bee Reserves
JFM	Joint Forest Management
LUP	Land Use Planning
MGNP	Mgahinga National Park
MMAL	Match Maker Associates Limited
MNRT	Ministry of Natural Resources and Tourism
NBP	National Beekeeping Policy
NFP	National Forestry Policy

NGO	Non Governmental Organization
NRs	Natural Resources
NRM	Natural Resource Management
PGIS	Participatory Geographical Information System
PLA	Participatory Learning and Action
PRA	Participatory Rural Appraisal
SPSS	Statistical Package for Social Sciences
SAGUN	Strengthened Actions for Governance in Utilization of Natural Resources
SUA	Sokoine University of Agriculture
TNRF	Tanzania Natural Resources Forum
TRSE	Tanga Regional Socio-Economic Profile
URT	United Republic of Tanzania
USAID	United States Agency for International Development
USD	United States Dollar
VEC	Village Executive Committee
VFR	Village Land Forest Reserve
WMA	Wild Life Management Area
WUMs	West Usambara Mountains

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

1.1.1 Natural resource management

Natural resources form the basis for livelihood for the vast majority of the population in Sub Saharan African (SSA) (Chileshe, 2005; Diagana, 2003). Agriculture dominates most African economies and employs approximately 65% of the labour force in SSA (Staatz and Dembélé, 2008). In Africa, an estimated 90% of the population uses wood fuel for cooking. In SSA firewood supplies constitute approximately 52% of all energy sources (Cleaver and Schreiber, 1993). Unabated natural resource degradation continues to threaten food and income security as well as the general livelihood of the majority of the population and environmental integrity in SSA region (Chamshama and Nduwayezu, 2002). Pressure and competition on natural resources due to increasing population (Berkes *et al*., 1998; Halperin and Shear, 2005), resource degradation (Halperin and Shear, 2005; Cleveland, 2008) and commercialization is intensifying on both governments and communities (Cleveland, 2008).

Extensive deforestation and encroachment on marginal lands has led to reduction in land cover, (Wily and Dewees, 2001; Chamshama and Nduwayezu, 2002; FBD, 2005) widespread runoff and erosion (Rowe *et al*., 1994; Nduwamungu, 2001; Mowo *et al*., 2002); siltation and pollution of water bodies. For example, MNRT (1989) estimated that Tanzania was losing between 300 000 and 400 000 ha of forest per annum while other sources such as FAO (1993) showed that the natural forests in Tanzania had decreased by about 12.7% from 1980 to 1990. There is also extensive

evidence of reduced dry season river flows and drying up of springs and seepage. In West Usambara for example, a total of 400 streams and several springs have ceased to exist or became seasonal due to deforestation (Nduwamungu, 2001; MNRT, 2001).

Research and development in SSA have developed many technologies to mitigate production constraints and improve natural resource productivity (Raussen *et al*., 2002; Gebremedhin, 2004). However, uptake of results has been limited especially among the poor and vulnerable groups (Gundel *et al*., 2001; Chokkalingam, 2001; Lalika and Machangu, 2008). Frequently cited reasons include inability of small scale producers to invest in natural resource management (NRM) (Berkes *et al*., 1998), inadequate information flow (TNRF, 2009), and diverging community needs and interests (Berkes *et al*., 1998; Sanginga *et al*., 2007). Thus new approaches to NRM need to be participatory, locally based and sensitive to people's problems, priorities, interests and perceptions (Blomely,2003; Sanginga, *et al*., 2007) and combining resource conservation and livelihood improvement. However, NRM is principally a function of environmental governance, which is largely determined by the institutions that mediate human resource relationships through the allocation and enforcement of rights of use, access, tenure and transfer (Kallonga *et al*., 2003; Gebremedhin, 2004; Zahabu *et al*., 2009).

According to Tanzania Natural Resource forum (TNRF) (TNRF, 2009), the quality and equity of governance fundamentally determines how natural resources are managed, support livelihoods of communities and economic development of the country. Efforts to improve NRM should therefore, address fundamental issues

including good governance (Robbins, 2000; Méthot *et al*., 2006) and well managed ecosystems that generate sustainable services and values needed by a diverse range of people and interests (Halperin and Shear, 2005). A number of examples cited demonstrate the role of good governance in achieving sustainable NRM. According to TNRF reports (TNRF, 2009), the forum is working to bring together a diverse range of stakeholders and interests to share information, build collaborations and pool resources towards a common aim of better and devolved NRM. In Botswana, Community Based Natural Resource Management Support Programme (CBNRM) promotes equity, natural resource conservation and social development to local communities by providing access to natural resources (NRs) thus reducing resource use conflicts at local level (USAID, 2009). The CBNRM for example offers framework for dealing with divergent interests and conflicts in a participatory and equitable manner, particularly regarding NRs use and access. In Nepal, the Strengthened Actions for Governance on Utilization of Natural Resources (SAGUN) Programme (USAID, 2006) has significantly contributed to reduce resource use conflicts by incorporating more pro poor and economic empowerment activities into NRM efforts at the local and national levels.

Land is the basis for agriculture, lakes and rivers, forests and wetlands. Unfortunately, over the last decades, increased population, divergent interests and perceptions have put pressure on NRs leading to over exploitation and degradation and in extreme cases, conflicts (Blomley, 2003; Sanginga *et al*., 2007).

1.1.2 Apiculture and natural resource management

Apiculture refers to the management of bees and processing of bee products from natural forests, plantation or other habitats (MNRT, 1998). Several studies (FAO, 2009; Ejigu *et al*., 2009; Tanganyika, 2009) have documented that apiculture is a sustainable form of agriculture which is beneficial to the environment and provides economic reasons for the conservation of natural resources and potentially increasing yield of food and forage crops. Other studies (Kihwele *et al*., 1999; FAO, 2003; Lalika and Machangu, 2008) indicated that apiculture is a source of food, raw material for various industries, medicine, income for beekeepers increased government revenue through levies and taxes, improved biodiversity conservation and enhancing environmental resilience

Mwakatobe and Mlingwa (2005) reported that apiculture generates about USD 1.7 million annually for the Tanzanian economy from sales of honey and bee wax. FAO (2003) and Lietaer (2009) observed that apiculture is an important sustainable and alternative source of income in rural areas, benefiting communities living in and around forests. Lietaer (2009) further pointed out that apiculture can also be a practical tool for raising the awareness of communities on the importance of good management of natural resources and for stimulating their conservation, thereby improving biodiversity. The author further indicated that apiculture in general contributes to environmental protection through a reduction of the environmental effects from tree felling for traditional bee hive construction and from fire hazard from smoking beehives with inappropriate equipment.

Tanganyika (2009) indicated that bees are known to improve, and are seen by many policy makers as improvers of agricultural crop yields through their pollination of fruit trees and crops. Some studies (Rickets, 2004; Tanganyika, 2009; Lietaer, 2009) have shown gains in coffee yields and profit margins caused by the proximity of coffee bushes to natural forests that provide habitat for bees. For example, the study conducted by Rickets (2004) explored the economic benefits on coffee production of native ecosystems in Costa Rica. In this study it was found that forest-based pollinators increased coffee yields by 20 percent within approximately one kilometre of forest. The quality of the coffee near to the forest also improved as the frequency of ‘‘pea berries’’ was reduced by 27 percent. It was also reported that the economic value of the pollination services of the bees in two natural forest fragments (46 and 111 hectares) during 2000-2003, translated into US$60 000 per year for one Costa Rican farm. Studies by Temu *et al*. (2006), FAO (2009) and Lietaer (2009) indicated that crop yields can be increased by more than a third in the presence of bees in Africa. The authors indicated that about one third of all plants or plant products eaten by humans depend directly or indirectly on bees for their pollination. According to Tanganyika (2009), bees are also regarded in policy documents as important contributors to the maintenance and enhancement of ecosystem biodiversity.

Natural resources, namely, land, water and forests are potential livelihood assets that can support apiculture in Tanzania including the West Usambara Mountains (WUMs) (MNRT, 2003). However, in Africa and specifically in Tanzania, it is reported that most of the resource users have different interests of access and control of the natural resources (NRs) as a result of differences in wealth, political affiliations and their relationship to different institutions Therefore, addressing

stakeholders' divergent interests in a participatory manner is important in fostering natural resource conservation and regulating resource use conflicts that emerge and occur among stakeholders (FAO, 2003; Mandara, 2007).

1.1.3 Stakeholders diverging interests and perception with respect to apiculture and natural resource management (NRM).

FAO (2003) indicated that increased competition for natural resources (NRs) among multiple stakeholders with diverse interests is occurring worldwide within the current trends of globalization, democratization, decentralization and urbanization. Pound *et al.* (2003) noted however, that the current approach to NRM which treats ecosystem components separately (for example, independent disciplines, programmes and policies for soil, biodiversity, forestry, etc.) is unsuitable to addressing problems in complex ecosystems. The authors further argued that along with these new needs and opportunities, there are often tensions and conflicts, including disagreement over access rights and lack of consensus on management objectives. According to Ja'afar-Furo (2006), socio-economic factors including: culture (not allowing women to keep bees); little knowledge of beekeeping; lack of capital to buy improved beehives and protective clothing is a hindrance to practice apiculture for NRM effectively.

However, quantified results are not available from previous studies. Other authors (Farinde *et al*., 2005a; Gebremedhin, 2004) have reported that apiculture and related trades are often underplayed in both policy and planning due to the fact that the focus of rural development is mainly given to crop and livestock production as dominant activities in rural areas. In Ethiopia for example, the focus largely remained on

improved crop and livestock production despite government including sustainable natural resource management as one of the activities on a soil conservation project (Gebremedhin, 2004). Many other studies (Verma, 1990; Ja'afar-Furo, 2007; Oluwatusin, 2008; Lietaer, 2009) have reported that apiculture is frequently perceived as a pro-poor income generation activity as it is accessible to many members of a rural community, has low start-up costs and requires little land and labour.

The major economic activity in the WUMs, on which over 90% of the population depends, is agriculture (Mowo *et al*., 2002; Tenge *et al*., 2004). Most of the agricultural activities are on steep slopes and on the valley bottoms where irrigation for horticultural crops is possible. The West Usambara highlands are experiencing stress in terms of decline in farm size and crop production due to population pressure and land degradation. According to the URT (2002), the population in these highlands is estimated at 418 652 people and the annual growth rate is 2.8%, giving a population density greater than 100 people km^2. Coupled with this is the inheritance system and ownership of parcels of land in different catchments. The impact of this is seen in increasing land scarcity, fragmentation of lands into small uneconomical plots, limited attention of parcel of lands located away from the households, wide spread cultivation on marginal lands and encroaching into forest lands (Kimaro *et al*., 2010). Land degradation in WUMs attributed to poor land husbandry, increased erosion and decline in soil fertility and no/or limited use of fertilizers is common. The impact of this has been declining crop yields, increased food insecurity and reliance on food aid, poor nutrition and increased dependence on forest resources for

livelihoods. There is a lack of information on available technological options to natural resource management evidenced by poorly formulated policies and lack of community based approaches towards and natural resource management. Efforts to arrest land degradation in WUMs have progressed very slowly due to lack of adequate technologies and interventions that link specific profitable enterprises and sustainable NRM options. Apiculture is one of the interventions recently noted to play a major role in socio-economic development and conservation of natural resources (ASARECA, 2009).

1.2 Problem Statement and Justification

1.2.1 Problem statement

At present, limited research has been conducted in SSA and Tanzania in particular with regard to investigating stakeholders' diverging interests and the emerging conflicts in apiculture with respect to conservation of NRs. Extrapolation of stakeholders' interests and perceptions on apiculture from existing research findings is difficult due to lack of information on key stakeholders and their interests (Burgess, 2001). Of the 19 beekeeping development studies (MMAL, 2007) conducted in Tanzania in the recent past, 1997 – 2007, no studies have addressed the issue of stakeholders' diverging interests in the field of apiculture with respect to conservation of natural resources (MMAL, 2007). According to FAO (2007), it is argued that apiculture would not realize its potential if the needs, priorities and constraints of the main stakeholders are not taken into consideration particularly those of women. It has also been noted in other studies (Berkes *et al*., 1998; FAO, 2000; Blomley, 2003; Sanginga *et al*., 2007) that divergent interests generate tension

and power struggles between various stakeholders. For example, according to FAO (2007), gender disparity compounded by cultural norms and patriarchy render socio-economic status of women as being low in Tanzania despite the fact that women comprise about 50% of the population (URT, 2002).

Furthermore, it has been observed that different stakeholders (regulators, facilitators and users) in Tanzania view apiculture differently due to heterogeneity of interests. For example, different stakeholders including local communities, conservation agencies and the local councils have different priorities and goals which have been reported to be important factors for the organization and development of apiculture in Tanzania (Blomley, 2003; MMAL, 2007). However, these factors have not been adequately documented. Furthermore, the existing mechanisms employed by local communities to regulate stakeholder interests in apiculture with respect to conservation of natural resources (NRs) in Tanzania are not well understood. Therefore, it is upon these considerations that assessment of stakeholders' diverging interests and emerging conflict in apiculture with respect to conservation of natural resources in Tanzania is vital.

1.2.2 Justification

In Tanzania, land degradation is rampant particularly deforestation and forest degradation of water sources and river banks. Encroachment and degradation of the ecosystems with their designated buffer zones continues unabated due to increase in population of the farming community that sees every inch of land as cultivable land. Over 75% of Tanzania's population resides in rural areas where people rely upon agriculture and other natural resource uses (Kessy, 1998; FBD, 2005; Zahabu *et al*.,

2009). Consequently, the link between rural livelihoods and natural resource management is of fundamental importance to national prospects for economic growth and poverty reduction. Natural resource management, in turn, is principally a function of environmental governance. However, stakeholders diverging interests, perceptions and the emerging conflicts are key challenges that need to be addressed if the situation of land degradation is to be reversed. A reversal of environmental degradation requires livelihood options that change people's incentives, in particular the benefits and costs of resource use. Under these kinds of circumstances, win-win interventions in degraded ecosystems and buffer zones that satisfy both socio-economic demands and maintain the ecosystem's integrity are required. In Tanzania, apiculture is one such land use that has potential for conservation of natural resources while at the same time providing improved and sustainable livelihoods to the local communities.

Over the past decades, increased population and stakeholders' divergent interests have put excessive pressure on natural resources (NRs) leading to over exploitation, degradation and resource use conflicts. Degradation has contributed to progressive decline in resource productivity, reflected in declining forest products, reduced water quantity and quality and crop and livestock yields. Deforestation has also led to increased soil erosion due to encroachment on marginal lands. Addressing these issues requires thorough assessment and analysis of stakeholders' divergent interests in order to draw lessons for guiding conservation of NRs efforts in Tanzania. This study will contribute to knowledge on understanding stakeholders' diverging interests and emerging resource use conflicts with respect to utilization and

conservation of NRs in the study area and other areas with similar ecological and socio-economic conditions. The study will also help shape policy processes related to management and conservation of NRs.

1.3 Objectives

1.3.1 Overall objective

The overall objective of the study was to analyse the stakeholders' diverging interests and emerging resource use conflict/s in apiculture with respect to conservation of natural resources in Western Usambara Mountains (WUMs), Tanzania.

1.3.2 Specific objectives

i. To assess land use settings with respect to NRM in the study area.
ii. To identify key stakeholders and their interests with respect to apiculture in WUMs.
iii. To determine factors that influence stakeholders diverging interests in NRM with respect to apiculture in the study area.
iv. To identify the types of resource use conflicts underlying apiculture.
v. To assess socio-economic factors influencing resource use conflicts in apiculture and NRM.

1.3.3 Research questions

i) What are the land use settings with respect to NRM?

ii) Who are the key stakeholders in apiculture and NRM?

iii) What are the different interests influencing apiculture with respect to NRM?

iv) What factors influence the interests in apiculture with respect to NRM?

v) What types of resource use conflicts are prevalent in apiculture with respect to NRM?

vi) What are the socio-economic factors influencing the key resource use conflicts in apiculture with respect to NRM in the study area?

1.4 Conceptual Framework

The conceptual framework (Fig. 1) underlying the study is centred on a number of factors including apiculture as a resource, managed or unmanaged stakeholders diverging interests, the local community as resource users, the positive outcomes (sustainable use of natural resources) and the negative outcomes (resource use conflicts) which are the likely outcomes of the contemporary stakeholders' diverging interests.

It is hypothesized that unmanaged stakeholders' diverging interests lead to resource use conflicts. This is because they act as incentives for people to overexploit the available natural resources. Managed stakeholders' diverging interests lead to sustainable management of natural resources. Sustainable use of natural resources, managed stakeholders' diverging interests, poorly or unmanaged stakeholders' diverging interests and resource use conflicts are further influenced by socio economic factors.

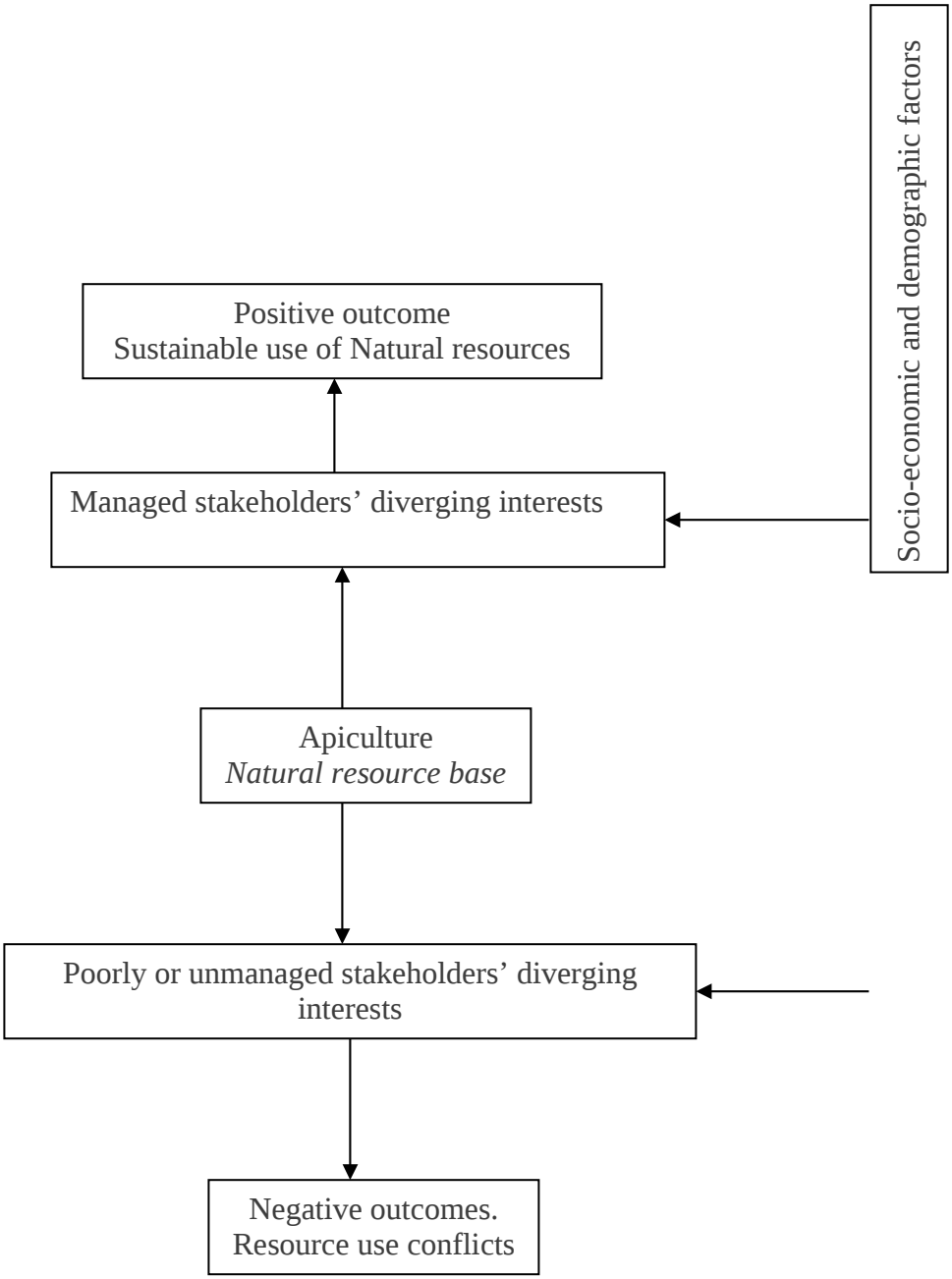

Figure 1: Conceptual framework underlying the study.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Overview

2.1.1 Definitions and basic concepts on apiculture with reference to NRM.

Participatory Geographical Information System (PGIS) is a merger of Participatory Learning and Action (PLA) with Geographical Information Technology (GIT) that facilitates the representation of the local people's spatial knowledge using maps (Rambaldi *et al*., 2006). PGIS could facilitate participation of different stakeholders when used properly by ensuring that there is equal opportunity in extent and room for all relevant stakeholders to participate (Triphathi and Bhattarya, 2004; Mandara, 2007).

A stakeholder is any party with an actual or potential interest in the economic, social or cultural use of a resource (Krishnarayan, 1998), as well as any individual, community, organization or institution who can affect, or be affected by, changes in the status and use of the resource. These individuals can be clustered into stakeholder categories according to their similarity in views, position(s) on an issue, and/or how they affect or are affected by the issue under discussion. They can be at any level or position in society, from global, national, regional concerns and down to the level of household or even intra-household. Woodcock (2002) argued that interest or stake may originate from an institutional mandate, geographical proximity (Adjacency to natural resources), historical/identity association and dependence for livelihood, economic interest and a variety of other capacities and concerns.

Diverging interests imply that there is a group or groups whose interests are opposed to those of conservation authorities or institutions where there are disagreements and disputes over access and control over use of natural resources (FAO, 2000). Interests are about what people want such as material goods while values refer to issues such as the sacredness of land, sanctity of human life and religious beliefs (Susskind *et al*., 1999).

Perception of apiculture refers to how different stakeholders view apiculture in relation to conservation of natural resources. Perceptions are driven by interests which if not managed might lead to emergence of conflicts between individuals and groups of different interests.

The term conflict (latent or manifest) can be understood as any situation in which there is a clash of interests and in which the groups whose interests are at stake are quarrelling over how to meet their respective interests. Conflicts imply tension, hostility, competition and disagreement over goals and values. In the protected area context, it usually suggests that there is a group or groups whose interests are in opposition to those of the protected area. The conflict can manifest itself as an overt struggle, involving illegal activity, arms and fighting, or it may be manifested as a debate among the stakeholders, perhaps in the press or in a courtroom.

Mvena *et al*. (2000) argued that conflicts can be thought of as opposite of cooperation and peace and can culminate into outright violence. Warner and Jones (1998) reported that conflicts often are thought of in negative connotation, but may

be looked upon as a force for positive social change adapting to a new political, economic or physical environment. This therefore requires that the resource be managed such that the resource provides for all interested parties.

Natural resources are taken to be those components of land that are of direct economic use for human population groups living in the area, or expected to move into the area: near-surface climatic conditions; soil and terrain conditions; freshwater conditions; and vegetational and animal conditions in so far as they provide produce. To a large degree, these resources can be quantified in economic terms which can be done irrespective of their location (intrinsic value) or in relation to their proximity to human settlements (situational value). Therefore Natural resource management (NRM) refers to the management of natural resources with a particular focus on how management affects the quality of life for both present and future generations. NRM is congruent with the concept of sustainable development, a scientific principle that forms a basis for sustainable global land management and environmental governance to conserve and preserve natural resources. NRM specifically focuses on a scientific and technical understanding of resources and ecology and the life-supporting capacity of those resources. Therefore, there is need to harness and expand upon this knowledge to inform stakeholder analysis for participatory NRM. Participatory NRM imply a process that engages stakeholders on multiple levels of decision making and facilitates the formation and strengthening of relationships among stakeholders for mutual learning (Grimble and Wellard, 1997; Dougill *et al*., 2006).

Apiculture is the science and art of bees and beekeeping in hives by humans. A beekeeper (or apiarist) keeps bees in order to collect honey and beeswax, to pollinate

crops, or to produce bees for sale to other beekeepers. A location where bees are kept is called an apiary (Tanganyika, 2009). The term apiculture will be used interchangeably with beekeeping.

Sustainable apiculture is the stewardship and use of beekeeping resources in a way and at a rate that maintains biodiversity, productivity, regeneration capacity, and vitality and the potential of these factors to fulfil, now and in the future, relevant environmental, social and economic functions.

2.1.2 Apiculture and its role in natural resource management in Africa.

According to FAO (2009), serious late season fires can cause considerable damage to forests and where these are caused by beekeepers, it is due to carelessness in the use of fire to create smoke during honey harvest, or from campfires, as beekeepers always camp in the forest while they are collecting honey. Clauss (1992) and Fischer (1993) in a survey undertaken in Zambia's North West Province argued that beekeepers were strong advocates for forest conservation, as they valued dense woodland and were keen to avoid damaging late fires. Clauss (1992) and Fischer (1993) noted further that "Beekeepers in Zambia are generally worried about late fires between August and October which widely scorch the flush and above all the flower of the most important nectar species like *Cryptosepalum exfoliatum pseudotaxus, Brachystegia spp. and Copaifera*". FAO (2009) observed that early burning is a conventional forest management practice that is employed to prevent late season wild fires, and it is reported that beekeepers understand and are supportive of this practice.

It is reported that beekeepers that have a clear financial gain from protecting the habitat of the bees are interested in forest conservation (FAO, 2009). Studies by Blomley (2003) and Tanganyika (2009) suggest that efforts to encourage beekeeping inside wildlife parks and reserve areas are beneficial for the livelihoods of nearby communities. For example, in Nyika National Park, Malawi, the Department of National Parks and Wildlife encouraged local people to place beehives in suitable foraging locations within the park. The authors also reported the added advantage that beekeepers will engage in controlled early burning near their hives to protect them from later destructive wildfires. It is further reported that this activity also benefits naturally regenerating trees from the damaging effect of fires. Furthermore during the honey harvesting periods, the beekeepers spend reasonable time in the park and can act as additional eyes and ears for the Park staff, and help to see and report poachers (FAO, 2009).

The National Beekeeping Policy (NBP, 1998) of Tanzania advocates for the creation of bee reserves in reserved areas as a strategy to continue to promote beekeeping within the country (URT, 1998). This development has been taken in recognition of the positive relationship between beekeeping and forest protection, and that without adequate forest protection the bee industry could collapse. Therefore, when innovation in resource management is driven by perceived trade-offs, participatory assessments of livelihood strategies are important for developing a common understanding of how these depend on natural resource assets (Carney, 1998). Kajembe *et al*. (2003) posit that making the people living adjacent to the forests the guardians of the resource in the neighbourhood appears to be the most viable,

effective, cheaper and long lasting way to manage the resources. In this case, community involvement acts as a built in mechanism for sustainability.

Other studies (Verma, 1990; MNRT, 2001; Temu *et al*., 2006; Lalika and Machangu, 2008; Lietaer, 2009) have documented the importance of apiculture in agricultural pollination and sustainable management of natural resources and increased biodiversity. For example MNRT (2001) reported that apiculture in Mlola division in Lushoto district is very useful and important for forest resource management. This is because where beekeepers have put their beehives they protect and avoid bush fires, and discourage people from cutting timber, poles and other forest resources. After some time these areas become green as the vegetation is allowed to grow.

Mwakatobe and Mlingwa (2005) indicated that the economy of Tanzania largely depends on the agricultural sector which employs more than 85% of the rural population who directly depend on natural resources and contributes about 50% of the GDP and 60% of the foreign exchange earnings. Verma (1990) indicated that mountain areas are faced with serious environmental problems such as soil erosion, degradation of watersheds and catchments, deforestation and desertification. The author further noted that development strategies in mountain areas needed reorientation in order to strike a satisfactory balance between population increase, natural resource base and environmental health. According to Verma (1990), Nel *et al*. (2000) and Lietaer (2009), diversification of productive activities on a given piece of land to include apiculture is certainly beneficial to ecology through the encouragement of enhanced plant pollination and the conservation of indigenous bee forage plants. Nel *et al*. (2000) indicated further that the value of apiculture is

particularly apparent in areas where there is pressure on land resources owing to population growth and the associated excessive subdivision of land.

2.1.3 Sustainable apiculture

Sustainable apiculture means that beekeeping will continue to improve and preserve its existence (Halil *et al*., 2007). Sustainable apiculture includes establishment of apiculture as an alternative to destructive use of natural resources, biodiversity conservation and alleviation of poverty. Thomas *et al*. (2002) indicated that apiculture is an important, sustainable, integral agricultural activity under the rural development programmes in India, since it provides nutritional, economic, and ecological security and balance. According to MNRT (2004), sustainable apiculture implies that the responsibility for managing apiculture resources is shared among a wide range of stakeholders at all levels. The Beekeeping Development and Conservation (BDC, a nongovernmental organization in Cameroon summed up sustainable apiculture as in its motto; “more trees, more bees, more honey, more money, more happiness”. Lietaer (2009) argued that cultural activities, such as the adoption of more sustainable honey harvesting techniques that improve the conservation of bees, can indirectly aid the conservation of forest ecosystems in national parks and other protected areas. Furthermore, Lietaer (2009) posit that the necessary financial, extensional and technological support is required to fully exploit the potential of apiculture in the conservation of forest and natural ecosystem.

FAO (2003) observed that apiculture contributes to all four fundamentals of sustainability:

- To environmental sustainability, as the beekeepers come to understand the link between beekeeping and forest conservation;
- To economic sustainability, by being a low-input rural activity that provides strong economic returns;
- To cultural sustainability, by being an activity that integrates well with other agricultural activities and that can be practised by men, women, and youths; and
- To social sustainability, by reducing poverty and enhancing quality of life.

Chambers and Conway (1992) indicated that successful apiculture draws upon all the categories of capital assets as summarized in Table 1.

Table 1: Capital assets needed for apiculture

Types of capital assets needed for beekeeping	
Natural resources	Bees, a place to keep them, water, sunshine, biodiversity and environmental resources;
Human resources	Skills, knowledge, good health and strength, and marketing expertise;
Physical resources	Tools, equipment, transport, roads, clean water, energy and buildings;
Social resources	Help from families, friends and networks, membership of groups and access to a wider society, market information and research findings;
Financial resources	Cash, savings and access to credit or grants.

Source: FAO (2004). Beekeeping and sustainable livelihoods.

Bees are natural resources that are freely available in the wild. Where bees have not been poisoned, damaged or harmed, they will collect wherever they are able, provided the natural conditions include available flowering plants. Wild or cultivated areas, wasteland and even areas where there may be land mines all have value for beekeeping. Beekeeping is possible in arid areas and places where crops or other enterprises have failed; the roots of nectar-bearing trees may still be able to reach the water table far below the surface. This makes beekeeping feasible in marginal conditions, which is important for people who need to restore their livelihoods or create new ones (FAO, 2009).

Although beekeeping can only rarely become the sole source of income and livelihood for people in the third world, its role as a source of supplementary earnings, food, and employment should not be underestimated. Key points in the arguments that beekeeping is a key element in promoting rural self-reliance are that:

- Beekeeping promotes rural diversification and hence is an alternative source of income and employment, particularly in areas where arable land is restricted and demographic growth is resulting in insufficiently profitable land holdings.

- Beekeeping is an activity that can successfully be adopted by women in many parts of the continent.

- Beekeeping allows for a degree of risk avoidance by providing a reliable, high value product that enables rural farmers to survive in times of economic crisis.

- Beekeeping is a low cost, sustainable undertaking with a low environmental impact.

2.2 Land use Setting with Reference to Natural Resource Management (NRM)

2.2.1 Participatory geographical information system (PGIS) and spatial distribution of interests with respect to apiculture

Mandara (2007) carried out a study in Duru Haitemba – Babati using PGIS as tool to locate the various stakeholders in relation to grazing resources and related conflicts. In this study PGIS facilitated the identification of grazing practices, resources and their changes as well as hidden grazing related conflicts that involve agro-pastoralists and other actors from local through the district to national level. The study also established that conflicts are spatially distributed in forest areas, around water sources and along water bodies because of incompatible interests and goals. The study concluded that while the village and district perceived the areas fragile and needed to be conserved, the agro-pastoralists perceived the same areas as reliable sources of grazing resources.

Mandara (2007) also observed that PGIS could be useful in facilitating community awareness and mobilization for resource use conflict management as the approach supports spatial illustration of the interaction between environmental variables and local land use decisions. The author further observed that the application of Geographical Information System (GIS) can succeed in preparing stakeholders for consensus in conflict sustained by values or interests (Kyem, 2004). In respect to apiculture mapping the locations of beehives in relation to natural resources (NRs),

residences and infrastructure can simplify the visualization of the apiculture industry in an area. Therefore, addressing divergent interests in a participatory manner is important in fostering natural resource conservation and regulating resource use conflicts that occur among stakeholders.

2.2.2 Land use and land cover changes

Briassoulis (2000) defined land use and land cover changes as the quantitative changes in the areal extent (increase or decrease) of a given type of land use or land cover. Vanacker (2002) observed that changes in land use and land cover have been occurring rapidly involving large areas especially in developing countries. Meyer and Turner (1996) suggest that land use alters land cover in three ways: (a) converting the land cover or changing it to a qualitatively different state, (b) modifying it or quantitatively changing its condition without full conversion and (c) maintaining it in its condition against natural agents of change. Several studies (Mowo *et al*., 2002; Makundi *et al*., 2006; Hubeau, 2010) noted in West Usambara Mountains that most changes of the present and recent past are due to human actions resulting from uses of the land for cultivation and settlement. The authors observed that land use and land cover changes are largely driven by the need to meet the ever increasing resource consumption (energy and food) of the ever increasing human population.

According to Hubeau (2010), changes in population density may affect land use choices by increasing the scarcity of land relative to labour which creates pressure on natural resources. Kaoneka (1993) carried out an analysis of land use changes in the West Usambara Mountains, Tanzania and found that the natural forest reserves

declined at a fairly high rate of 3.8% per year on the expense of land for cultivation and settlements which increased dramatically by 83% per year. The author reported that this change was mainly due to population increase which resulted into more pressure on forest resources. Shemdoe (2002) also observed that the dominant land uses were subsistence and cash crop agriculture (covering 58% of the area), orchards and commercial plantations (11%), indigenous protected forest reserves (16%), and pastures (15%). Thus, the increasing population in West Usambara Mountains has stimulated wide utilization of natural resources including land for cultivation and settlements, forest services such as wood for fuel, building materials and medicinal purposes.

2.2.3 Apiculture as an incentive and strategy to land use planning and environmental conservation in Tanzania

The Agenda 21, (UNCED, 1992) indicates that Land Use planning (LUP) plays a key role in natural resource management. In the case of competing stakes and interests in the use of land, it allows to settle arising conflicts and to conciliate interests in such a way that agreements can be reached which guarantee the sustainability of land resources. According to Amler *et al.* (1999), LUP follows an integrated planning approach linking up various sectorial strategies, while at the same time it is closely related to other instruments of natural resource management such as land tenure and property rights. According to Lietaer (2009), apiculture can be used to deal with the issue of property rights over natural areas. The author observed that the issue of property rights over natural areas has been proven to be

essential in the sustainable use of natural resources. For example, In Tanzania bee-reserves have been established with exclusive access for beekeepers (MNRT, 1998).

In Tanzania, the government has put in place the National Land Use Planning Commission and Management as a tool for environmental conservation among others. Other policies in place include Wildlife Policy (URT, 1998); the National Environmental Policy (URT, 1997) which provide the legal framework to confirm government intentions to empower beekeepers to own and manage natural resources (e.g. bee reserves) so as to prevent and control degradation of life supporting systems including land, water, vegetation and air. Other policy documents include: The Environmental Management Act (EMA) (2004); National Forestry policy (NFP) (1998), National Beekeeping Policy (NBP) (1998), Land Act (1999) and Village Land Act (1999). The above policy instruments have a number of statements which support natural resource conservation and management. For example; the NBP (1998) encourages active participation of all stakeholders in the establishment and sustainable management of bee reserves and apiaries, promoting beekeeping-based industries and products and promoting sustainable management of beekeeping in cross–sectoral areas for ecosystem conservation and management. This is supported by policy statements from the Tanzania Beekeeping Policy which include**:**

Policy statement (1): To ensure sustainable existence of honey bees, the government will establish and manage bee reserves with specific functions of sustainable management of indigenous honeybees including rare stinging and stingless bee species. The government or specialized agency will then enter into joint management agreements with organized local communities or organizations of

people living adjacent to bee reserves, under appropriate user rights and benefits from such bee reserves in order to ensure their sustainable management.

Policy statement (2): To enable participation of all stakeholders in conserving and managing honeybees, individual beekeepers and organized communities will be encouraged under government guidelines, to establish, manage and own bee reserves for carrying out sustainable beekeeping activities.

Policy statement (16): Individual beekeepers, beekeepers' associations and cooperatives will be encouraged to establish and manage apiaries in public land. To ascertain sustainable management and utilization of bees and bee fodder resources, appropriate beekeeping equipment and management methods will be used.

The National Forestry Policy (NFP) also provides opportunities for beekeepers to practice apiculture in forest reserves. The policy statements include:-

Policy statement (1): To ensure sustainable supply of forest products and services and environmental conservation, all types of forest reserves will be managed for production and/or protection based on sustainable management objectives defined for each forest reserve. The management of all types of forest reserves will be based on forest management plans.

According to NFP (1998), **policy statement (5**) exists to "enable sustainable management of forest on public/general lands, clear ownership for all forests and trees on public/general land will be defined. The allocation of forests and their management responsibility will be promoted". Related to this policy statement, the

government has tried to allocate open forests to villages and private individuals. According to Haruyama and Toko (2005), the number of local forest management practices (Joint Forest Management (JFM) and Community Based Forest Management (CBFM)) has increased to about 1 530 reserves in Tanzania.

Village Land Forest Reserve (VFR) is defined as a forest owned and managed by a village government and "village forest reserves will be managed by village governments or other entities designed by village governments for this purpose" (NFP, 1998, policy statement 6).

The EMA (2004), section 54, subsection 1 state as follows:

Notwithstanding any other written law for the time being regulating rivers, riverbanks, lakes or lakeshores and shoreline, the Minister responsible for protection of natural resources may, in consultation with other relevant Ministries, by notice published in the Gazette- declare a river, riverbank, lake, or lakeshore and shoreline a protected area for the purposes of this Act; and impose any restrictions as he considers necessary for the protection of the river, riverbank, lake or lakeshore and shorelines from environmental degradation. However, the act further states that the Minister shall have regard to among other things the interests of the communities around the river, riverbank, lake or lakeshore and shoreline concerned; and any advice that may be given by sector ministries while exercising powers under subsection (1). To this effect the Council and local government authorities responsible for environmental matters are required to issue guidelines and prescribe measures for the protection of riverbanks, rivers, lakes or lakeshores and shorelines.

The Wildlife Policy (1998) of Tanzania encourages apiculture activities to be carried out in Wildlife Management Areas (WMA) by involving local communities. With special permission (granted access rights) from the Director of Wildlife, beekeepers are allowed to carry out apiculture activities in game reserves and game controlled areas. Mwakatobe and Mlingwa (2005) explained that the village land act (1999) of Tanzania empowers the community at local level (village), recognizing it as an appropriate representative structure to implement community based natural resource management (CBNRM). The authors indicated further that beekeepers can be allocated land for beekeeping development through village land use management system. The authors also observed that the challenge was therefore to use this enabling environment created by the policies, programme and legal frameworks to encourage stakeholders to take up apiculture as tool for enhanced conservation of natural resources.

According to Van Lier (1988) and Kaoneka (1993) the purpose of land use planning policies is to foster land use and to harmonize the conflicting interests of various sectors in the economy. In particular, the land use planning process is designed to prevent degradation of the environment and maintain ecological balance. However, Mnzava and Riihinen (1989) indicated that experience has shown that most of the policies are pursued along sectorial lines than on multi-disciplinary basis hence promoting more conflicts than compatibility of various land uses. For example, Forestry and Wildlife Divisions both issued their policies in March 1998, which would suggest some degree of parallel evolution, the sectors have developed divergent strategies about how to devolve management to the village level. Inherent in the forestry sector’s provisions for Participatory Forest Management (PFM) is that

it builds on Tanzania's structures of local government and customary village based land tenure. The key institutional structures for PFM are the village council, village assembly and village natural resource committee with basic management tools being village by-laws and land use plans which are grounded in the Local Government Act and Village Land Act respectively.

On other hand, the Wildlife sector's provisions for local management through establishment of Wildlife Management Areas (WMAs) contrastingly require new community institutional structures.

2.3 Stakeholders and their Interests in Apiculture and Natural Resource Management (NRM).

2.3.1 Stakeholder analysis

Stakeholders are groups of people organized or unorganized who share interest or stake in a particular issue or system (Grimble and Wellard, 1997). The authors indicated further that stakeholders could be at any level or position in society and that they range from the more nebulous categories of future generations, international interests, the national interests and the wider society. The stakeholders may need the resource for subsistence, large and small commercial activities, conservation and tourism or for cultural reasons such as use of sacred sites. Renard *et al*. (2001) and Sanginga *et al.* (2007) noted that as the range of stakeholders concerned with NRM broadens the complexity of the inter-linkages between them increases and so do the pressure on natural resources (NRs) at local, national and or international levels. Renard *et al*. (2001) argued that in such context, the potential for conflict emerging is high and tools to examine and address these relationships are

needed. In this regard, capacities need to be developed for identification of the full spectrum of stakeholders and thus reconcile different interests in the hope of transforming contested natural resources into shared assets capable of meeting divergent interests, needs and reduce emergence of conflict among stakeholders (Berkes *et al*., 1998; Renard, 2004; Prell *et al*., 2008).

According to MNRT (2001), involving stakeholders enables the government to delegate some of its functions which in turn help spread the costs which would otherwise be borne by government alone. Analysing who stakeholders are, what their interests are and their roles is a useful tool in policy development as stakeholders represent systems with their own objectives, resources and sensitivities (MNRT, 2003). Studies by Berkes *et al.* (1998) and FAO (2000) indicated that when planners and managers fail to identify and consult with the full spectrum of stakeholders, they limit their understanding of these groups' diverse needs and priorities and their indigenous knowledge of the situation. This increases the likelihood of stakeholders' divergent interests and this in turn leads to emergence of resource use conflicts.

2.3.2 Stakeholders' interests and roles in apiculture.

Renard *et al*. (2004) carried out a study to evaluate the integration of stakeholders in NRM in the Caribbean region. The study focused on practical methods for the identification of stakeholders, and for the analysis of their interests, roles, impacts, benefits, expectations and capacities (individuals, communities, groups and institutions). The study concluded that inadequate or incomplete uses of these tools have been responsible for the weaknesses or failures of many NRM initiatives in recent times. Renard *et al*. (2001) further asserted that the ultimate goal of NRM is to

increase participation, transform institutions and to guarantee a more equitable distribution of rights and responsibilities. These are based on the hypothesis that participatory approaches to NRM benefit both the resource, in terms of sustainability of uses and the people who need and use that resource.

Nombo (1995) and Farinde *et al*. (2005b) in their studies in the Uluguru Mountains, Morogoro, Tanzania and Oyo state in Nigeria respectively urged that group setting promotes sharing and exchange of ideas towards problem solving despite individual differences in interests. The authors further pointed out that farmer group approach can provide farmers with strong cohesive leadership over divergent interests. Advantages of farmer groups were acknowledged by Sanginga *et al*. (2001) in their study in the highlands of Kabale, Uganda, that Farmers Group Model (FGM) promotes collective learning and exchanges that occur in group settings and ensures that more people participate, through improved dialogue, efficiency in using resources and enhanced linkages. The authors further argued that capacity building and competence development of groups creates immediate interests of the people to participate in natural resource management initiatives. The approach also provides farmers with either direct access to political power or political means of acquisition. Renard (2004) emphasized that to ensure full participation in natural resource management initiatives, all stakeholders at community level need to be involved, educated and sensitized about their rights, responsibilities and expected returns.

Haruyama and Toko (2005) analysed NRM specifically forest management in the WUMs. The study focused on the identification and roles of stakeholders in forest management. They found that identification of stakeholders and responsibilities in

NRM is important for forest management since political negotiation between the stakeholders determines the practical success of forest management. In order to evaluate the importance of a stakeholder, the authors considered their degree of entitlements – i.e. the rights, responsibilities, relationships and returns (4Rs) – of each stakeholder. The study also found that identifying stakeholders can tackle the ambiguity of community based forest management (CBFM) practices in Africa by giving clear responsibilities and rights to each stakeholder. The study concluded that defined user rights of a particular natural resource must be clear and responsibilities of different stakeholders including beekeeping groups stated well in advance and their diverging interests known. Similar observations were also made by Willy and Mbaya (2001) and Sanginga *et al.* (2007) in Tanzania and Uganda respectively. In Tanzania for example, under joint management of bee reserves (JMB), contractual agreements specifying the authority, responsibilities and distribution of costs and benefits amongst concerned parties are made.

According to MNRT (1998) and MNRT (2001), the main stakeholders identified in apiculture in Tanzania include: the central government, local government, Non-Governmental Organisations (NGOs), Faith Based Organisations (FBOs); local communities (Individuals and farmer groups) and the international community. Several studies on contested NRM (Blomely, 2003; Sanginga *et al*., 2007; Zahabu *et al*., 2009) identified similar stakeholders.

According to the NBP (1998), the role of central government is to provide policy, management of strategic bee reserves and further devolve NRM to other stakeholders who have defined roles. The role of local government as defined by MNRT (1998),

include: law enforcement, coordination and management of extension services, revenue collection, establishment and management of bee reserves, joint management of bee reserves and demonstration apiaries.

The roles of private sector includes joint management of bee reserves, provision of employment, sustainable harvesting and utilization of bee and floral resources by using appropriate equipment, awareness raising, provision of extension services and financing investments in apiculture. The roles of NGOs include awareness raising, provision of extension services, capacity building, training and technical assistance, financing of apiculture and environmental conservation. The local community has the roles of conserving and managing honeybees and bee fodder in village and private bee reserves, establishment and joint management of village reserves, formulation and enforcement of bylaws and participation in NRM activities (MNRT, 1998; FBD, 2005).

Other stakeholders include supporting and collaborative government institutions and the international community who are perceived as partners in sustainable development. Several studies (Kessy, 1998; Warner and Jones 1998; Pound *et al*., 2003; Blomely, 2003; Renard *et al*., 2004; Haruyama and Toko, 2005; Sanginga. 2007; Zahabu *et al*., 2009) have shown general agreement that various stakeholders with own vested interests can play significant roles in the management of natural resources. Woodcock (2002) in his study in the Eastern Arc Mountains, Tanzania, indicated that stakeholders' interests in natural resource management (NRM) were influenced by economic demands, livelihood needs, institutional mandate and

geographical proximity **(**adjacency to natural resources). Therefore, meaningful NRM should be characterized by local communities living adjacent to natural resources sharing power and not just benefits (MNRT, 1998, NBP, 1998; NFP, 1998).

The key stakeholders identified with respect to apiculture in the study area include the small scale farmers; beekeeping groups; Faith based organization and Research and Training institutions.

2.3.3 Divergence of interests with respect to apiculture development and NRM

Mostert (1998) and Singh and Sinha (2002) hypothesize that conflicts involving governments, their agencies, private sector and local communities generally arise because of disagreements on the course of action to be taken. Dorcey (2004) assert that there are several sources of diverging interests and perceptions which can be grouped into three categories namely: factual disagreement, conflicting goals and relational aspects. Mostert (1998) points out that factual disagreement are due to uncertain facts, lack of or poor information and limited capacity to process information; Conflicting goals are related to different interests and values where as relational aspects are due to problems in the relations between actors involved hence distrust and power struggles.

According to Matthias (2005), the disagreements can also occur in a cooperative or competitive context such as when incompatible interests or values develop between two or more persons, groups or nations. Kyem (2004) and McCall (2004) indicated

that diverging interests and perceptions are normally between parties or groups of people who hold different interests, have different needs, values and preferences.

Blomely (2003) carried out a study in Uganda to explain the conflicts between resource poor households, national and international interests on biodiversity in two critical ecosystems of Bwindi Impenetrable and Mgahinga Gorilla National Parks (BINP and MGNP). In this study it was found that the conflict over forest resources in BINP and MGNP was ultimately an expression of different interests among different social actors (stakeholders) at various levels and unequal power relationships between them. National and international concerns for biodiversity conservation, watershed catchment functions and generation of foreign exchange earnings through tourism appear to have superseded and significantly displaced local interests in increased agricultural production, utilization of biodiversity resources and securing sustainable livelihoods including apiculture. Depending on the importance and conservation priority of a natural resource, communities may be denied regular access and user rights of key biodiversity and services found in a protected area. The author noted further that the situation prior to the re-establishment of apiculture impacted negatively on the natural resources as locals kept setting up fires in the protected areas. For example sixteen fires were started in and around the park by local residents with deliberate intent of destroying the park (Blomley, 2003; Sanginga *et al*., 2007). The study concluded that the process of identification of allowable uses of forest resources for harvest was long and complicated by power plays, divergent interests of communities and park management (Blomley 2003; Sanginga *et al*., 2007).

Other studies (Agrawal, 1990; Agrawal and Gibson, 1999; Mason and Muller, 2007) observed that the recognition that communities comprise multiple interests and actors is a useful step forward because it also pushes toward an analysis of how different actors within communities view their interests, and how the interests and identities of actors change over time. The authors noted further that the recognition that groups within communities have divergent interests, and that those traditionally excluded should find representation not just on the basis of equity. Therefore opening up the community directs attention towards the ways in which multiple actors and interests influence the processes of conservation and the institutional arrangements that address the politics of natural resource conservation processes.

2.3.4 The role of institutions in regulating diverging interests, perception and emerging conflicts in apiculture

The role of institutions has been reported by Kisoza *et al*. (2004) to be effective in moderating divergent interests and resource use conflicts. Agrawal (1995) and Mason and Muller (2007) observed that all multiple actors within and outside communities have divergent interests implying that they would engage in uncertain political negotiations in the absence of institutions. Agrawal (1995) noted that institutions remain the primary mechanisms available to mediate, ease, structure, mould, accentuate, or facilitate particular outcomes and actions of multiple actors. Furthermore, attention must be given on the ways in which asymmetrically placed actors within communities interact with each other and with external actors, the forces that influence their interactions, and the kinds of outcomes these interactions create as these possess the potential to reshape formal and informal institutions toward the dominant mode of action. In this context, institutions are seen as sets of

formal and informal rules and norms that shape interactions of humans with others and natural resources.

In a study conducted by Mohamed (2009) in Kilombero District to assess the role of local governance structures in regulating forest benefits in Nyanganje forest reserve. The study found that both formal and informal structures were in place. The formal local structures included Village Governments, Village Environmental Committees and Village Natural Resource Committees. On the other hand informal institutions included beekeeping groups and traditional healers.

2.4 Natural Resource use Conflicts.

2.4.1 Conflicts in the context of natural resource management.

The management of natural resources is an area of international concern because of rapid changing socio-economic and development pressures. Matthias (2005) posit that a situation where groups of people or societies are using scarce resources that are contested among multiple users with different uses and at varying levels raise three challenging questions that administrators, scholars and managers struggle with. First and foremost is how these people with divergent perceptions and interests can wisely use the resources in a cooperative way without compromising its productivity? Secondly, is how scarcity and degradation of the environment lead to natural resource use conflicts? Thirdly, is how the resulting situation can be managed? According to Coser (1956) cited by Mbeyale (2009), conflict is a struggle over values and claims exerted on scarce resources in which the aims of the opponents are to neutralize, injure or eliminate their rivals. It can be deduced therefore that at least two parties interact in an incompatible way in which at least

one involved party intends or ignores the negative impact on the other party and that at least one of the parties involved experience damages from the interaction. Natural resources do not have a specific use value per se but the forms in which natural resources are used and their value are a function of the interest in and demand for them articulated by people within a specific context, and is dependent on the general political and social conditions, technological feasibility and economic needs (Matthias, 2005).

Conflict does not necessarily imply outright violence; rather it includes tensions, hostility, competition and disagreements over goals and values. Mvena *et al*. (2000) argued that conflict is often thought as the opposite of cooperation and peace and is commonly associated with violence. Conflicts are crucial not only for social change but also for the continuous creation of societies. Therefore, conflict should not be viewed as a dysfunctional relationship between individuals and communities that should be avoided at all costs but also as an opportunity for constructive change and growth. However, this should not be taken to mean that conflicts do not have tragic consequences for people and societies. Conflicts are often accompanied by suffering, destruction, fear, pain, separation and death. Matthias (2005) argued that the term conflict is used to designate any relationship between opposing forces whether marked by violence or not. The term also extends to include not only the observable aspects of the opposing forces but also the underlying tensions between them (latent/manifest).

Sandole (1998) defined latent conflict as a stage in the development of a conflict where one or more groups, parties or states question existing values, issues or

objectives that have a national relevance. However, conflicts must carry some identifiable and observable signs in order to be recognized and noticed such as positional differences and clashing interests articulated as demands or claims. On the other hand manifest conflict refers to a stage when tensions are present but are expressed by means below the threshold of violence such as tense relations between parties. Economic sanctions, for example, are a means by which a latent conflict can be turned into a manifest. Manifest conflicts are like latent conflicts at all stages carried out by non-violent means and without use of armed force.

Lewis (1997) posits that the term conflict also refers to any situation in which there is a clash of interests or ideas. In most instances, the interests and needs are incompatible amongst users, and sometimes these interests and needs are not properly addressed in natural resources policies and programmes (FAO, 2000). Lewis (1997) argued further that many of these conflicts are counterproductive and destructive leading to hostile relationships. In the context of natural resources management, the term resource use conflicts suggests that there is a group or groups whose interests are opposed to those of conservation authorities or institutions where there are disagreements and disputes over access and control over use of natural resources (FAO, 2000).

Conflict over natural resources is ubiquitous (Ayling and Kelly, 1997). People in different parts of the world have competed for use of natural resources they need in order to enhance their livelihoods (Blomley, 2003; Matthias, 2005). However, the dimensions, levels and intensity vary greatly. They can be of different forms and at

different levels ranging from local to global scale and the occurrences depend on their relevance or result from local actors who influence the broader decision making process (Grimble and Wellard, 1997; Warner, 1998; Oviedo, 1999; Mbeyale, 2009).

2.4.2 Nature and types of resource use conflicts

Several studies (Grimble and Wellard, 1997; Warner and Jones, 1998; Shemwatta *et a.* 2004; Sanginga *et al*., 2007; Mbeyale, 2009) have shown that natural resource use conflicts differ from site to site due to differences in the conflict generating factors. This is influenced by many factors such as population pressure, economic activities, institutional arrangements, policies, poverty and general awareness on both users and authorities (Grimble and Wellard, 1997; Warner, 2000; Mbeyale, 2009). Warner and Jones (1998) and Mbeyale (2009) illustrated that in natural resource settings, different types of natural resource use conflicts can be categorized depending on the type of stakeholders involved and the scale of occurrence i.e. micro – micro or micro – macro levels, among community members, groups or between groups (resource users) and outside government (regulators), private or civil society organizations/NGOs (facilitators). Micro – micro conflicts can further be categorized as taking place either within the group directly involved in the use and management of a particular resource regime (e.g. a beekeeping group) or between the user group and women entering the forest to collect firewood (Warner, 2000). The following are some of the types of conflicts common to natural resources management.

Intra micro-micro conflicts

- Disputes over land and resource ownership, e.g. between private and communal

land owners;

- Disputes over land boundaries between individuals or groups;
- Latent family and relationship disputes;
- Disputes due to CBNRM projects/schemes being captured by elites and/or those who happen to own resources of a higher quality;
- Breaking of common property resource (CPR) constitutional or operational rules, such as protection agreements for grazing areas, fish net sizes, forests, or misappropriation of funds etc.
- Disputes over the unfair distribution of work and profits.

Inter micro-micro conflicts

- Conflict between ‘land owners’ and ‘resource users’;
- Conflict between indigenous common property resource groups, and more recent settlers;
- Disputes generated by jealousy related to growing wealth disparities;
- Lack of cooperation between different community groups;
- Disputes over renewal arrangements for leased land;
- Internal land ownership disputes ignited by the speculation activities of commercial companies; and
- Resentment built up due to lack of representation on village committees.

Micro-Macro conflicts

- Cultural conflicts between community groups and ‘outsiders’;
- Project management disputes between community groups and outside project-sponsors;

- Disputes caused by political influence (national, provincial or local);
- Disputes arising from differences between the aspirations of community groups and expectations of NGOs or commercial companies; and Off-site environmental impacts affecting unintended third-parties.

In many parts of the world, sustainable use and management of natural resources are inevitably faced with challenges that involve conflicting interests and needs of the people (Berkes *et al*., 1998; Lovet, 1998). Protected areas are refugees of tranquillity and peace, yet are also viewed as places where natural resource use conflicts due to rapid changes in bio-physical environment and socio-cultural systems operate. According to Pendzich *et al*. (1994), communities are in most instances aware of the importance of natural resources in meeting their immediate needs as well as those of the future generations, but they are faced with obstacles in maintaining or developing sustainable management of these resources. In general, the understanding of the nature of natural resource use conflicts may vary among various stakeholders depending upon their interest, motivations, knowledge and resources (Prell *et al*., 2008; Mbeyale, 2009). According to Warner (2000), Maganga *et al.* (2002) and Sanginga *et al*. (2007), the multiple nature of resource use conflict call for a pluralistic approach that recognizes the multiple perspectives of stakeholders and the effects of diverse causes of natural resource use conflict in dealing with them.

2.4.3 Causes of resource use conflicts in apiculture and natural resource management (NRM)

2.4.3.1 Conflicts in apiculture

Conflict in NRM is inevitable, granted that there are different uses of resources, different users, interests and value systems (FAO, 2000). Conflicts originate from

different perceptions by the parties involved regarding who should manage, use and benefit from natural resources.

Begg (2001) conducted a survey of the beekeeper -badger conflict in Western Cape Province in South Africa. The study focused on conflict between commercial beekeepers and honey badgers outside of protected areas which has been reported to be prevalent in South Africa. The survey revealed that honey badgers were causing direct losses exceeding $62 500 annually in this area alone. It was further reported that more than 80 % of beekeepers surveyed revealed that they had experienced problems from badgers and more than half admitted to killing them. This further set up conflict between beekeepers and conservationists which led to honey badger being listed as vulnerable and near threatened in 2002.

In Tanzania, conflicts in apiculture have been reported. FBD (2005) noted the use of fire in farm clearing and honey collection by honey hunters as the major cause of fire in the Eastern Arc Mountains including the West Usambara Mountains. Other conflicts reported with respect to apiculture include refusal by beekeepers to allow the cutting of timber, poles and other forest resources in places where they have put their beehives. MNRT (2001) indicated that after sometime these areas become green as the vegetation allowed to grow. Other causes of conflicts include mistrust within beekeeping group members and jealous by those who are not members of the group among others.

Other factors underlying different conflict situations in NRM have been reported. These include geographical, political and socio-economic factors. However, Warner

and Jones (1998) posits that in many rural areas the competition that arises due to a combination of demographic changes and the physical limits to sustainability of renewable natural resources (forests, water bodies, grazing areas, marine resources, wildlife and agricultural land) is often cited as the underlying cause of resource use conflicts. Conflicts can be aggravated or augmented by development.

Kisoza *et al*. (2004) argued that resource use conflicts occur when different categories of resource users have competing demands for shrinking resources and attaching different values to the resource base. Natural resource conflicts occur in settings that involve an array of culture, economic and political arrangements that have some bearings on the outcomes of the conflict process (Kumar, 1998). Resource use conflicts often emerge because people use and manage resources in different ways (FAO, 2000). The intensity of these conflicts have been reported to vary enormously from confusion and frustrations among community members over poorly communicated development and or conservation policies to violent clashes between groups over resource ownership, rights and management responsibility (Kant and Cooke, 1999).

2.4.3.2 Geographical location and control of natural resources/conflicts

Conflicts have been reported to be inevitable as they arise when people who live adjacent to and traditionally use the resource are denied access to them (Kiss, 1990). Resource use conflicts can also result from failure of central governments to recognize and empower the local people living adjacent to natural resources to

manage the resources. Essentially central governments lack in depth knowledge of resource management pattern to be able to make and enforce appropriate natural resource management regimes.

A change in natural resource ownership from common property regime to state property regime is another underlying cause of resource use conflicts as this makes it difficult for local people to access some natural resources (NRs). This is due to the fact that NRs are extracted covertly by local communities. This scenario gives a picture of the vanity of state hegemony at both macro and micro level over the management and utilization of NRs in communal lands (Kajembe and Mwihomeke, 2001). This in turn pits the state's conservation philosophy of protectionism against the local community's preferred sustainable utilization for development through exploitation of resources around them.

Lewis (1997) indicated that conflicts result from either lack of attention to the process of involving all stakeholders in the planning or management of NRs. Resource use conflicts also occur if policy is developed without the participation of resource dependent communities and without giving due regard to their needs and interests. Sometimes resource use conflicts emanate from personal centred interest of policy and project or program at the local level

2.4.3.3 Natural resource scarcity

Homer-Dixon and Blitt (1998) associated conflicts with resource scarcity that comes about with resource disruption. In a scarcity situation, the demand for resource is higher than supply hence conflict over insufficient resource. The more unequal is the

distribution of scarce resources in a system, the greater will be conflicts of interests between dominant and subordinate segments in a system (Mvena *et al*., 2000). Natural resource scarcity may also result from the unequal distribution of resources among individuals and social groups or ambiguities in the definition of rights to common property resources. The increasing scarcity of natural resources due to rapid environmental change (e.g. land and water degradation, extensive land clearing), increasing demand, and their unequal distribution is therefore among the potential causes of resource use conflicts. Kameri-Mbote (2004) indicated that resource scarcity can further be categorized as a structural scarcity in which infrastructure and distribution mechanisms unevenly redistribute the resource in question leading to either real or perceived scarcity. For example, it is argued that water may not necessarily be scarce in a particular location but that scarcity may be induced by institutional arrangements over shared water resources

2.4.3.4 Property rights and sustainable resource management

Eboh (2000) and Njuki (2004) indicated that different bundles of property rights affect the incentives individuals' face, the type of action they take and the outputs they achieve. An ideal property right regime gives the owner incentives for efficient resource allocation implying that the available input factors are used such that they give the highest possible output. The role of property rights in resource management and utilization is crucial, because the lack of some basic characteristics of property rights such as proper definition, exclusiveness, security, enforceability and transferability in local land markets is probably the single most important cause of problems related to natural resources management. Bromley and Cernea (1989)

argued that problems related to property rights are also a root cause of natural resources problems. Bromley and Cernea (1989) and Richards (1997) posit that degradation of natural resources is related to the redefinition of customary or indigenous property rights over common property to private or state property rights. Kessy (1998) and Njuki *et al*. (2004) contend that insecurity of land tenure promotes open access to natural resources such as forests and woodlands.

Malimbwi and Munyanziza (2004) and CFA (2007) indicated that attempts to move land tenure from centralized control to local or private control have demonstrated the efficiency gains that are possible in the recent past. However, the specific property right regimes that should be implemented are site specific. In small self-sustaining rural communities where strong traditions of community or tribal management of natural resources exist and where population and other external pressures are mild, community management of natural resources may be appropriate (MNRT, 2003). Traditional common property has been used successfully throughout history to manage natural resources on a sustainable basis. It should be noted however that lack of some basic characteristics of property rights such as proper definition, exclusiveness, security and enforceability is also a major cause of resource use conflicts in most parts of the rural areas.

2.4.3.5 Land tenure system in Africa.

Yemshaw and Amente (2003) carried out a study in Modjo Forest Plantation in Ethiopia to assess the nature of forest-related conflicts in state-managed forest projects. The study found that conflicts escalated when the local communities lost free access to graze their animals inside the project area, the right to own grazing

land, and the right to own farmland as a result of the establishment of the project. Other causes of conflict were unclear benefit-sharing mechanisms, unfulfilled promises regarding benefits from the project, scarcity of grazing land and unfair compensation for loss of grazing land. The study noted that owing to the prevailing poverty around the forest plantation, all community members wanted to have a share of the forest resources. The study concluded that there is need to recognize social heterogeneity of communities and diverse user groups, examine the incentive structure in forest management, improve understanding of stakeholders likely to get involved in managing forestry resources, and examine how the objectives of different stakeholders may change from time to time before an area is given protection status.

Chidhakwa (2001) conducted a study on villages adjacent to Haroni and Rusitu forests in Zimbabwe, where conflict started when the government set aside the forests as protected areas in the mid-1970s without taking local interests for forest services into account. These forests previously managed by local rural people for religious and economic purposes including apiculture were declared botanical reserves by the government, restricting local access and use. In this study it was found that conflict around the management of the Rusitu forests was characterized by differences in the way different people and organizations perceived the way that the forests could be conserved.

At play in the Rusitu conflict were differences in perceptions and interests of the stakeholders. Among the stakeholders, some were conservation- and preservation-

oriented (government institutions, mainly the Department of National Parks and Wildlife Management – DNPWLM), some were forest-dependent (the local people and private tourism companies), some were development-oriented (the NGOs) and some were profit oriented (individuals and private business).The study illustrated how governments and outside agencies ignore local management systems and institutions and try to impose new ones with the support of national legislation. This resulted in a conflict situation that manifested itself in various ways including arrests and fines being imposed on local people, and local people in turn causing bush fires and cultivating crops on the fringes of the forests.

Other studies in Indonesia (Moeliono and Fisher, 2003) and Uganda (Blomley, 2003; Sanginga, 2007) have shown that rural people have resisted having their lands taken without consultation for conservation purposes. For example, according to Lewis (1996), resource use conflicts in Tasmania occurred as communities were restricted only to forests outside the reserved areas due to the high concern of conservationists on flora and fauna. Kiss (1990) argued that the attitude of communities towards protected and conservation areas stem from scenarios such as loss of access to the resources and incomes generated from the reserved areas including apiculture.

2.4.3.6 Land tenure system in Tanzania

Land tenure is an important factor, which ultimately affects the conservation of natural resources as it defines the ownership of a resource. The ownership can either be full and exclusive ownership of the resource or the right to use the resource without owning it (usufruct). According to URT (1999), the Land Act divided land resources into three categories, namely reserved land, village land and general land.

The Land Act deals with the management of reserved land and general land while the Village Land Act is concerned with the village land (Willy and Mbaya, 2001; Kallonga *et al*., 2003; Haruyama and Toko, 2005; Zahabu *et al*., 2009). In addition to the Land Acts, the reserved land falls under sectorial pieces of legislations including Beekeeping Act, Forest Act, National Parks Ordinance, Wildlife Conservation Act, and Town and Country Planning Ordinance. Inherent in all these acts is the fact that only when people can satisfy their needs; have control of the resource base as well as have secure tenure, that long term objectives of environmental protection can be satisfied. Kajembe (1994) indicated that tenure rules being a result of existing social relations are always in a state of dynamic change implying that new rules are created through changing interpretation of existing rules as social relations change. In Tanzania all land is vested in the president and people's rights to land are dependent on the use they make of it. Theoretically land is not a commercial commodity meaning that land cannot be transacted. However, experience has shown that land is inherited, exchanged, purchased and leased (Kajembe, 1994).

In Tanzania, land tenure is characterized by the existence of two parallel tenure systems namely; customary (use) rights and statutory (ownership) rights. The official laws mainly apply to communal fields while the traditional tenure rights are still valid for most individually held land. In pre-colonial times there was no formal authority in charge of land allocation because land was plenty (Zahabu *et al*., 2009). Tenure rights were based on the principle of occupancy and membership in a community. During the colonial period, persons holding the administrative posts of chiefs and sub chiefs became responsible for allocating land to those who asked for assistance. Land allocation to indigenous people was not a problem per se and did

not fall within the routine work of the chiefs. However, the chiefs were called upon to mediate and settle land tenure conflicts (Kajembe, 1994).

The village and Ujamaa Village Act of 1975 was the major policy document formulating the official policy towards land tenure. People were moved into village centres and allocated new land within the village as a territorial unit. It is vital to note that the allocation of land made at the inception of villagization and afterwards was based upon witnessed verbal agreements. In the recent years, a surge of people reclaiming their former lands on the basis of customary rights were experienced in a number of villages. In response to this government passed Act No. 88 of 1987 giving legal precedence to statutory law as implemented during the villagization period and later by village councils.

In most traditional systems all lands were claimed either privately or communally. The concept of vacant or unclaimed land was introduced by colonial governments and applied especially to forests. Traditionally land belongs to the tribe or clan and those belonging to the clan have rights to the clan's resources based on continual exercise of those rights. In an event that any area is abandoned, it reverts to the communal property of the social unit and can in principle be used by any other member. Regulated access to and ownership of natural resources thus exists in the tropics and is recognized by neighbours. However, in the absence of legal titles, it has to be continuously exercised and defended against intruders or usurpers (Kajembe, 1994).

According to Kessy (1998) and Njuki *et al*. (2004), insecurity of tenure has resulted in a number of environmental problems including promotion of open access to natural resources such as forests and woodlands. Zahabu *et al*. (2009) observed that certain reserved lands such as forests and game controlled areas are found within village lands. For example, 16 out of the 35 million ha of forest land in Tanzania are unreserved, and most of these forests are in village lands making them either open access or customary managed by local institutions. In this regard there are obvious overlaps between the Land Act and the Village Land Act. In this context, land tenure in Tanzania can be defined as a combination of legally and customarily defined land ownership rights. (Reeb and Romano, 2007).

Njuki *et al*. (2004) indicated that land tenure systems have implications in the management of natural resources. For instance the nature of property rights over forests and their economic value have been identified as major causes of deforestation in several developing countries (Dolisca *et al*., 2007). The study carried out by Dolisca *et al.* (2007) in Haiti found that land tenure significantly affects farmers' decisions, and farmers who use land illegally are likely to clear more forests for agriculture. Similar observations were also made by Kessy (1998), Njuki *et al*. (2004) and Zahabu *et al*. (2009) in Tanzania. The main forms of land tenure in WUMs include public estates, customary land system and individual farms. The main system being the customary land tenure arrangement (Kaoneka, 1993; Hubeau, 2010).

Table 2 shows the land class ownership by public, private and community in Tanzania.

Table 2: Land classes and tenure systems in Tanzania

Ownership of land		
Public	Private	Community/customary
General Land Reserved land	Granted rights in general and reserved land. Customary rights in reserved and village lands	Village lands

Sources: country reports; Alden Wily and Mbaya, (2001).

2.4.4 Conflict management/resolutions mechanism

Warner and Jones (1998) indicated that there are hidden and latent conflicts that can hardly offer the opportunity for common ground to be easily resolved. Hence most authors refer to conflict management rather than conflict resolution. In assessing conflict resolutions Kajembe *et al.* (2004) made reference to six different conflict management strategies namely; avoidance, mediation, negotiation, arbitration, coercion and adjudication. There are formal and informal ways of dealing with conflict. Formal practices are those which involve official procedures; guided by governmental rules, regulation and laws. Informal practices are locally developed, practiced and enforced by the communities. Informal practices are normally administered by local people who are wise and trusted to do that in a socially and morally accepted manner. The local people who deal with informal conflict management practices are supposed to be wise, diplomatic, intelligent, trusted and stable. People involved in natural resource conflicts take courses of action based on their preferences, their understanding of their options, their perceived likelihood for success and their relationship with an opponent (Renard, 2004). Experience by

various scientists in rural Tanzania suggests that local communities use mostly negotiation approach, and only in some rare cases adjudication for resolving conflicts (Kajembe and Mwihomeka, 2001).

2.5 Socio-economic Factors Influencing Stakeholders' Diverging Interests, Resource use Conflicts and Sustainable Natural Resource Management (NRM)

Socio-economic factors refer to economic, social and institutional patterns and their linkages that comprise the context of development. Socio-economic factors at whatever level of social system such as farming and environment make people interact through interests, roles and relationships. Misana *et al*. (1996) argued that the dynamics of land use and ecosystem integrity are not only based on the ecological and geographical factors of altitude and climate, particularly rainfall with soil playing a big role, but also on socio-economic factors.

Borrini-Feyerabend *et al.* (1997) and Kessy (1998) postulated that population growth puts more pressure on natural resources and that declining natural resources (NRs) make life more difficult for people. In regard to rural areas of the developing world, rapid population growth would mean increased demand for fuel wood and more land for settlement and cultivation and thus leading to emergence of natural resource use conflicts. Socio-economic factors may also influence resource use conflicts in different situations. The socio-economic factors considered here include age, sex, duration of stay in the area, household size, and level of education, ethnicity, land size, level of interest and major economic activities. All these factors such as land use and tenure, level of education, household size, land size etc. have a bearing on

sustainable management of NRs. In Tanzania, increased clearing of land for agriculture for example is a growing problem (Mowo *et al*., 2002; Makundi *et al*., 2006). Therefore, the role of socio-economic factors in promoting proper land use cannot be ignored.

Differences in age, sex, and ethnicity may influence behaviour of the user of NRs resulting into the cultural and social dimensions of conflicts (Asyby *et al*., 1989; Singh *et al*., 2003) These symbolic dimensions of NRs lend themselves to social, ideological and political struggles that have enormous practical significance for the management of these resources and in the process of resource use conflict management. The conflicts that emerge due to differences in age are termed as intergenerational conflicts. This occurs because young generations perceive things differently from old generations. For example, the young generation can continue to cut down trees for poles to build houses while the old generations tend to prohibit the exercise.

The study conducted in Handeni, Tanzania, by Kajembe and Mwihomeke (2001) found that inter-generational conflicts occur between elders who impose restrictions on the young ones on the use of natural resources. The fact is that young people prefer to cut poles for construction of their houses and selling forest products for economic purposes while elders may prefer protecting and conserving these resources upon which other livelihoods such as apiculture depend on. The authors further argued that this was a conflict over elders imposing what was perceived to be an invented tradition for compelling the young generation to start with brick houses when those elders started off with poles and mud houses. Despite the conservation

rationality of the “invented” tradition, the youth tend to object it. Singh *et al*. (2003) contended that age has significant effect on experience, wealth and decision making and affects how one works thus influencing individual interests. Sumbi (2004) in a study conducted in Udzungwa Mountains, Tanzania, indicated that resource use conflicts decreased with increased age of community members.

Other factors including level of education and household size among others also influence stakeholders’ divergent interests and resource use conflicts resulting into either escalation or de-escalation of divergent interests or resource use conflicts. Education for instance shapes our attitudes and actions regarding the use of natural resources (Katani, 1999; Mbwambo, 2000). Mbwilo (2002) and Shemwatta (2004) argued that people go to school to enhance their livelihood strategies and to develop an understanding and appreciation of the interaction between the physical world and human societies. Education tend to affect natural resource use by raising aspirations, facilitating the development of technology and pointing the way to better natural resource management. Maro (1995) contended that education plays a vital role in socio-economic development of a particular society. As a tool of knowledge transfer, education has been reported to foster human creativity. Mbwambo (2000) reported that people who are more educated tend to plant more trees for their own uses at their homesteads as opposed to less educated ones. The author argued that planting of trees around homesteads reduces pressure on both protected and common pool resources thereby reducing chances of resource use conflicts. Therefore, education influences farmers’ readiness to integrate innovations into traditional systems of land use and management (Kajembe, 1994; Maro, 1995; Mbwilo, 2002; Nnema and Adaeze, 2006).

Households generally reflect our conditioned actions and attitudes towards NRs and their use. Households involve social systems of privileges and responsibilities and have an important impact on the economic behaviour of household members. This is due to the fact that in most cases it is households that operate as planning units rather than as individuals (World Bank, 1995; Mbwilo, 2002). Individual operators take the responsibility for making decisions, but the decisions they make are tailored toward the general wellbeing of the household members. Household goals provide incentives for the development and use of NRs.

According to Kessy (1998), gender dimensions reflect clear division of labour at household level as most African females do most of the household chores such as cooking, taking care of children while males go out to search for opportunities to improve household welfare. On the other hand, gender as a social relation has a profound influence on the interests/roles men and women play in the management and conservation of NRs. The interests/roles are clearly identified on the basis of age and sex. This is due to gender based utilisation of NRs for instance forest services. A study conducted by Robinson (2006) covering six regions (Iringa, Arusha, Tanga, Kilimanjaro, Lindi and Mbeya) in Tanzania to assess stakeholder knowledge, awareness and perception on participatory forestry management revealed that women were less interested than men. These findings reflect the different interests' men and women have towards natural resource management. The interests are clearly defined on the basis of sex.

According to Eboh (2000) and Njuki (2004), land use related rights play a crucial role in determining the use and sustainable management of NRs, since they specify

access to the land, the resources on it and the rights of using them. Eboh (2000) further argues that since increased tenure security is often linked to sustainable farming practices, it is also likely to promote NRM. It is assumed that people are only willing to invest their scarce resources if they know that, ultimately they will reap the benefits. With enough land, people may have opportunities to cultivate a variety of food crops while carrying out conservation activities (Mbwambo, 2000). Availability of land is one of the determining factors to the success of management activities such as tree planting and contour farming. Farmers with land size available only for agricultural crops are normally less interested or are reluctant to plant rich nectar trees (Njana, 1998; Mbwambo, 2000). Land scarcity is a common feature in West Usambara Mountains, Lushoto, Tanzania (Kaoneka, 1993; Mowo *et al*., 2002; Hubeau, 2010).

Kallonga *et al*. (2003) reported that women consistently lack access to tenure of land and other NRs. Women's rights to land ownership are often prohibited by state laws and traditional norms. When women do not have control over NRs, they lack the interest and confidence to conserve them.

Farinde *et al.* (2005b) carried out a study in Oyo state, Nigeria. The study focused on improving farmers' attitude towards NRM. The study found that there were significant relationships between attitude of beekeepers and age (T = 2.202); years of formal education (T = 9.846); membership of social organization (T = 4.938) and Income (T = 2.420) compared to the critical value of T at 5% level of significance and 69 d.f. of 2.000. The study concluded that the higher the age, income, years of

education and the more the membership of the social organization of the respondents the more favourable their attitude towards NRM.

Malugu (2007) analysed socio-economic factors underlying resource use conflicts in Pugu and Kazimzumbwi forest reserves in Kisarawe and Ilala districts in Tanzania. In this study it was found that ethnicity, household size, land size and education level of respondents positively correlated whereas age negatively correlated with resource use conflicts. The study concluded that increase in ethnic groups in the area tended to increase resource use conflicts. This was attributed to the fact that different ethnic groups have different norms and cultural perceptions towards use and management of natural resources.

Ja'afar-furo (2007) appraised the perception of urban and rural farming communities towards adoption of apiculture as a farming system in Adamawa state, Nigeria. The study concluded that most members perceived apiculture as a farming system that could be adopted as a subsidiary economic activity rather than major economic activity. Apiculture, which was the farming system of interest, only accounted for 5.62% of the population as their primary occupation. The author concluded that there was perhaps a feeling that the benefits from apiculture might not be adequate to sustain their families.

CHAPTER THREE

3.0 MATERIALS AND METHODS

3.1 Description of the Study Area

3.1.1 Location

The West Usambara Mountains (WUMs) are located in Lushoto district, Tanga region, North East of Tanzania (Figure 2). The mountains are located between UTM coordinates 0417627 to 0430952 E and 9492811 to 9465655 N in UTM zone 37 South and cover about 35 km^2. The West Usambara mountain block contains 23 gazetted Forest Reserves (Nyambo, 2006). The altitude of the area ranges from 400m in the valley bottoms to above 2000m above sea level in the summits of the dissected mountain ridges and hills.

3.1.2 Climate

The average annual rainfall ranges between 800 and 1000mm per annum. The rainfall has a bimodal pattern, with long rains starting from March through June and short rains from October to December (Tenge *et al*., 2004). The mean annual temperature is 25-27 ^{o} C in the warmer dry areas while in the higher elevation (>500m a.s.l) the mean annual temperature range is between 17 and 18 ^{o}C (Neerinckx, 2010). The mean annual relative humidity of the study area is 70%.

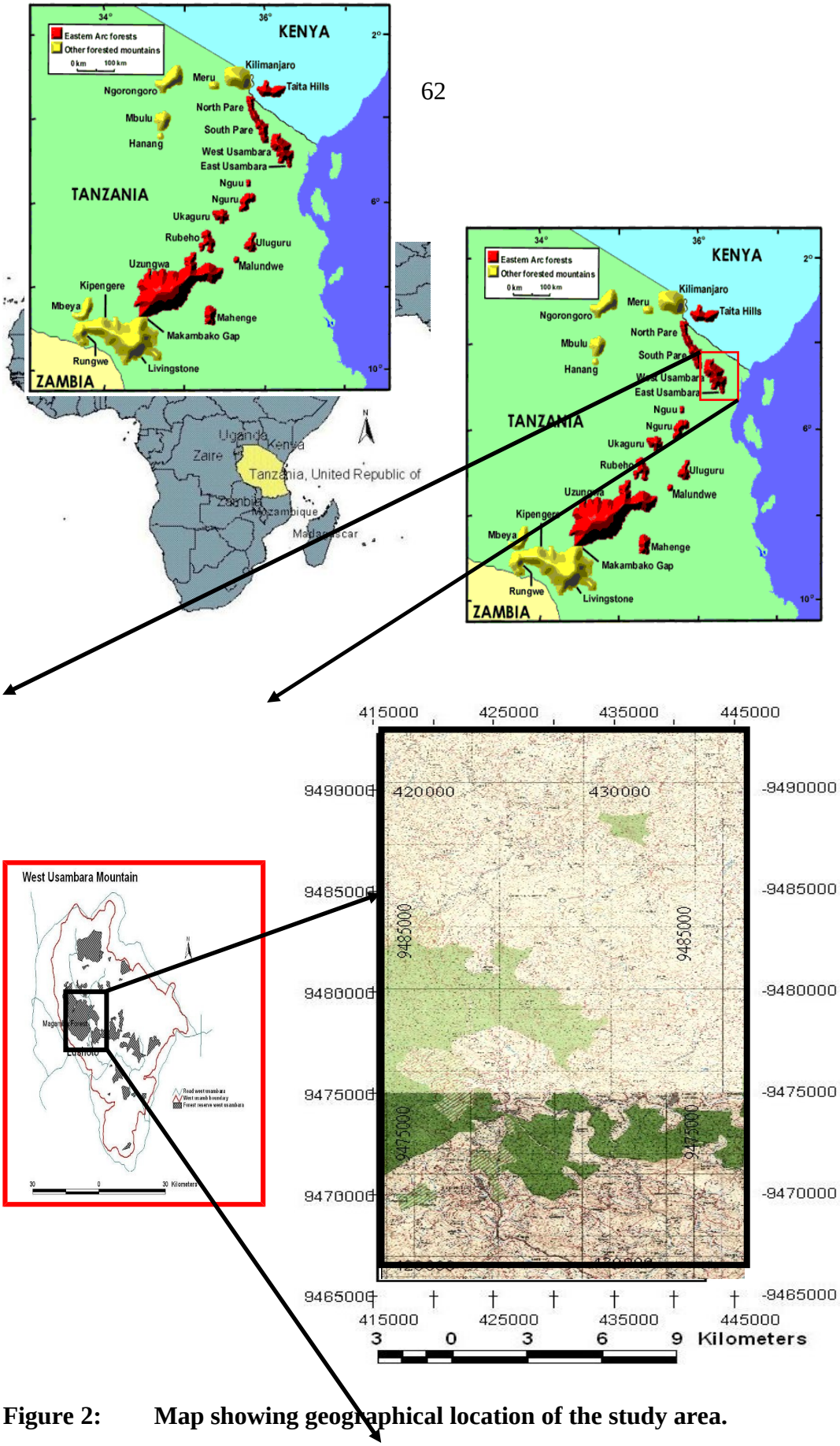

Figure 2: Map showing geographical location of the study area.

3.1.3 Vegetation

Until the end of the 19th century, most of WUMs were covered by mountain rain forest (Kaoneka and Monela, 2000). However, over time most of the natural vegetation has been cleared for crop cultivation and plantation forest. The dominant vegetation in the study area has been classified on the basis of elevation (Kaoneka, 1993) as given in Table 3.

Table 3: **Vegetation classification in WUMs.**

Vegetation class	Elevation
Lowland evergreen forest	< 750 m above sea level (a.s.l.)
Intermediate forest	750 – 1400 m a.s.l.
Highland evergreen forest	> 1500 m a.s.l.

Source: Kaoneka, (1993).

The main vegetation of the West Usambara Mountains is natural forest and plantation forest. The vegetation of the natural forest is *Camphor-Podo* vegetation, montane and afro-montane rain forest vegetation. The forest is composed of camphor (*Ocotea usambarensis*) with podo (*Podocarpus usambarensis* and *Podocarpus pensiculi*) and an undergrowth of *Lanthus cirumilee* and other shrubs. Associated species are *Parinari excelsa, Pygeum Africanum, Ficalhoa laurifolie, Polyas* spp., *Macarange kilimandscharica, Chrysophylum* spp.,*Olea hochstetteri and Cassipoura* spp. The major species of the plantations are cedar (*Juniperus procera*), cypress (*Cupressus lusstanica*), *Pinus radiate* (Masunga, 2009; Hubeau, 2010). The montane forests are undergoing rapid degradation from different human activities (Stanley *et al*., 1998).

3.1.4 Land use

Smallholder farming is the main economic activity for majority of the households in Lushoto District (Mowo *et al*., 2002; Tenge *et al*., 2004; Davis *et al*., 2006). More than 90% of the population in Lushoto district depends on agriculture as the main economic activity. The Wasambaa are peasant farmers whereas the Wapare and Wambugu are agro-pastoralists (Hubeau, 2010). Most cultivation is done on sloping land where soil erosion is increasingly severe. The valley bottoms are intensively used for vegetable production where water from furrow irrigation is for production of horticultural crops. The dominant land uses include subsistence and cash crop agriculture (covering 58% of the area), orchards and commercial plantations (11%); indigenous protected forest reserves (16%), and pastures (15%) (Shemdoe, 2002). The main cash crops are vegetables, fruits and Irish potatoes while maize (*Zea mays)*, cassava (*Manihot esculenta)*, beans (*Phaseolus lunatus*) and potato (*Solanum tuberosum*) are the main food crops (Kamugisha *et al*., 2007).

3.1.5 Population

According to 2008 data, the population in Tanzania was estimated to be about 42 million of which over 80% lived in rural areas (Maganga *et al*., 2002). The population in Lushoto district is more than 430,000 of whom 54.4% were women in 2006. The composition of the population profile is young, with 48% under the age of 14. The Lushoto district is the most densely populated area in Tanzania with a mean annual growth rate of 2.8% and the population density is 124 persons per square kilometre. In Lushoto district, 96% of the population is rural; (NBS, 2003). In the West Usambara Mountains, three major ethnic groups are settled namely the

Wasambaa tribe contributing about 80% of the population, the Wambughu tribe (14%) and the Wapare tribe (5%). The remaining 1% consists of immigrants from different regions. The average farm size is about 1.8 ha per household and the average household size is 6 (TRSE, 2006).

3.2 Methodology

3.2.1 Pre-field work

3.2.1.1 Collection of materials and relevant data

Before going to the field, acquisition of study materials, literature research, preparation of questionnaires and base maps were undertaken. The activities carried out include.

- Preparation of data collection instruments (Questionnaires, Checklist for key informants and Focus group discussions).
- Purchase and collection of Topographic maps scale 1:50 000 from Mlingano Agricultural Research Institute of the Ministry of Agriculture located in Tanga,Tanzania. (Mkomazi sheet No. 109/1 and Mlalo sheet No. 109/2).
- Collection of hand held Etrex GPS receiver Garmin Software and digital camera
- Collection of aerial photos (1996) at a scale of 1:36 000 (run numbers 1717 – 1722; 1748 – 1752; 1640 – 1647; 3397 – 3400; 4090 – 4094 and 4146 – 4149.

Review of reports and dissertations of previous studies was also done. These reports included those done by Kaoneka (1993), Mowo *et al* (2002), Haruyama and Toko

(2005), Tenge *et al*., (2005) and Neerinckx (2006). Published research materials and reports from other parts of the world on the subject matter were searched from the internet and libraries at Sokoine University of Agriculture (SUA) and Lushoto district headquarters.

3.2.1.2 Data interpretation and preparation of base maps

In this study interpretation of the acquired remote sensing data, landsat images and aerial photographic including orthophoto mosaics was carried out to obtain base maps for land use types, spatial location of beehives in the different agro-ecological zones. The interpretation exercise was done in the remote sensing and GIS laboratory of Sokoine University of Agriculture (SUA). Photo and image elements including roads, rivers, streams, settlements and cultivated and plantations were identified on the photo/images/topographic map and mapped using Arc view software. On screen digitization of the elements was the common procedure used to capture the elements in digital format. Other elements were derived from topographic maps. The above mapped elements were integrated in a GIS environment to produce base maps of the study area with details on broad land use types. Contour map was also produced which was used to divide the study area into three agro-ecological zones based on rainfall and elevation.

3.2.2 Field work

3.2.2.1 Research design and survey methods

The study employed a cross sectional design which allows data to be collected at one point in time from a selected sample of respondents using standard survey

techniques(Participatory Rural Appraisal including household questionnaire survey, focused group discussions, participant observation and key informants). This design is used in descriptive studies for determination of relationships of variables (Bailey, 1994.) In this study the design was used to determine the relationship between stakeholders' diverging interests, and the emerging resource use conflicts in apiculture. The study adopted the sampling technique as postulated by Bailey (1994) who contended that the minimum sample should be at least 30 respondents regardless of the population size as indicated in Table 4.

Table 4: Household sampling

S/N	Zone	Number of households	Population	Sample size
1	Cold humid (Lushoto suburbs/Migambo)	4781	23236	36
2	Cold dry (Lukozi/Malindi)	3133	14100	32
3	Warm dry (Mwangoi)	1086	4890	30
Total		9000	42226	98

3.2.2.2 Sampling procedure

The purposive sampling procedure was applied to select the district and the study block. The study area was stratified into three agro-ecological zones namely cold humid zone (Lushoto Township and Migambo village), Cold dry zone (Lukozi and Mnadani villages) and warm dry zone(Mwangoi village). The sampling frames were the lists of beekeepers and non-beekeepers respectively in each zone. The beekeepers that belonged to groups were randomly sampled from the group lists while individuals practicing apiculture were randomly sampled from a separately prepared list. Non -beekeepers were selected at random from a list of farmers that are not

involved in beekeeping. A total of 98 respondents were interviewed using questionnaires to obtain primary data of the study area.

The World Bank (1995), defined household as a unit consisting of one or more persons related or unrelated who live together in one part or of more than housing/dwelling and have a common catering arrangement. In this study, a household was represented by either a husband or a wife, or a mother for a female headed household or any representative of the household who is above 18 years of age. In this study, the household was considered an appropriate sampling unit. It is perceived that it is from this unit that divergent interests and perceptions of respondents can be measured.

3.2.2.3 Data collection

Data captured included:

- Types of land uses in the study area.
- Different types of stakeholders involved in apiculture
- Different interest categories in apiculture
- Type of resource use conflicts
- Nature of resource use of conflicts.
- Socio-economic factors influencing stakeholders' diverging interests and resource use conflicts in apiculture.

Details of data collected, source of data and type of analyses are summarized in Appendix 1.

The tools used to collect data are presented hereunder.

(a) Questionnaire survey

The questionnaire survey (Appendix 2) was administered to selected households. The questions formulated in English were translated into Kiswahili to facilitate easy communication during data collection. In this study, both male and female households were eligible for interview. Pre-testing of the questionnaire was done during reconnaissance survey in order to check reliability and validity of the questionnaire items (Mettrick, 1993). The data collected using this tool included, socio-economic data of households, identification of stakeholders and their interests, major economic activities undertaken by households, type and nature of resource use conflicts, socio-economic factors (age, household size, level of education, marital status, duration of residence in the area, level of interest in apiculture, land size) influencing stakeholders' diverging interests and resource use conflicts in apiculture in the study area.

(b) Focus group discussions

Focused group discussions (FGDs) were carried out with key people guided by a checklist of questions (Appendix 3) to collect qualitative data to complement information collected from the household questionnaire survey. The FGDs targeted people with fair understanding of apiculture including village chairpersons and village secretaries, village elders of both sexes and seasoned beekeepers. Four (4) FGDs were conducted in the study area; one in the warm dry zone comprising 10 men and five female, two in the cold dry zone comprising 10 men and 5 women (Mnadani) while the FGD at Lukozi comprised of 9 men and 5 women; and one in the cold humid zone with 6 men and 3 women. Discussions during FGDs focused on

identification of stakeholders (primary or secondary) and their interests (income generation, conservation of natural resources, forest services), perception of households regarding importance of apiculture, major economic activities undertaken, types and nature resource use conflicts as described by Grimble and Wellard (1997) and Warner and Jones (1998), socio-economic factors (age, household size, level of education, marital status, duration of residence in the area, level of interest in apiculture, and land size) influencing stakeholders diverging interests and resource use conflicts in apiculture.

(c) Key informants survey

A key informant is an individual who is knowledgeable, accessible and willing to talk about the issue/s under study (Mbwambo, 2000). In this respect, a checklist (Appendix 3) was used to collect information from key informants. Key informants in this study included: village elders; The Roman Catholic Church; school/s, village leaders; functional officers such as district beekeeping officer, natural resources officer, environmental officer, forest officers and extension officers who were consulted to obtain more information about the study. Informal discussions were also conducted with relevant parties like the District Agriculture and Livestock Development Officer (DALDO) and Village Executive Officers (VEOs). The focus of such informal discussions was to determine how these officers perceived apiculture as tool for natural resource management (NRM). The data collected included: type of stakeholders; different interest categories; perceptions and factors influencing them; type and nature of resource use conflicts; Socio economic factors underlying stakeholders diverging interests and resource use conflicts in apiculture;

performance of different enterprises at farm level; and respondents' perceptions of apiculture.

(d) Participant observation

This method facilitated collection of information on land uses setting of the study area. The method involved observation of the present state of natural resources and taking some photographs of the status of natural resources, observing local people's activities, behaviours, relationships, phenomenon, networks and processes in the field to supplement information collected through other methods.

(e) Secondary data collection

Secondary data were collected through documentary reviews of both published and unpublished documents.

(f) Participatory geographical information system

Participatory Geographical Information system (PGIS) was used to generate a map showing location of beehives for households involved in apiculture. The community members located the spatial distribution of household beehives, beekeeping group beehives and land use types on topographic map scale 1:50,000. The Universal Transverse Mercator (UTM) co-ordinates were captured for all beehives on the ground using a Geographical Positioning System (GPS) as presented in section 4.1.2, Fig. 4.

3.2.3 Post field work

3.2.3.1 Data analysis

Both qualitative and quantitative methods of data analysis were employed in order to address the study objectives.

3.2.3.2 Content analyses of qualitative data

Content analysis is a set of methods for analysing the symbolic content of any communication with an intention to reduce the total content of communication to some set of categories that represent some characteristics of research interests (Singleton *et al*., 1993). By using this method, the information collected through verbal discussions with the key informants was analysed in details whereby the recorded dialogues with key informants were broken down into smallest meaningful units of data and used to generate information.

3.2.3.3 Quantitative statistical analysis

The data collected through structured questionnaire was coded to facilitate data entry into the computer. Both descriptive and inferential statistical analyses were carried out for quantitative data. The completed questionnaire was sorted out and wherever applicable data from open-ended responses were categorized and transformed to enable further analysis. All quantitative analyses were performed using Statistical Package for Social Sciences (SPSS 16.0) and Excel. Frequencies and percentages, tables and figures were used to summarize the data.

Cross-tabulations involving Chi-Square tests were also employed in testing association between variables in the different agro-ecological zones. Inferential statistical analyses were also carried out to provide an idea about whether the patterns described in the sample are likely to apply to the population from which the sample was taken. Logistic regression models were developed and used to establish the relationships between dependent and independent variables. In this study, a number of explanatory variables were used in explaining the dependant variables stakeholders' diverging interests and resource use conflicts in the study area.

To test whether the regression coefficients are statistically significantly from zero, the wald statistic that asymptotically in large samples follows a Chi-Squared distribution was used. The wald statistic is distributed as Chi-square with degrees of freedom (df) equal to the number of constrained parameters (r). The odds ratios represented by Exp (ß) from logistical analysis were used in explaining the likelihood of stakeholders diverging interests and resource use conflicts. To assess the goodness of fit of the regression model to the data, the model chi-square at 5% probability level, the Hosmer and Lemeshow and classification table were used. The higher the percentage of classification the better the variables are explained in the model.

(a) Dependant variables Yi and Yj

The dependant variable stakeholders' diverging interests (Yi) was conceived as a composite determined by a number of variables as tabulated in appendix 4. The variables were scored on a 5 point scale (1 – 5; with 1 meaning very poor and 5

meaning very good) and the mean score computed for each household. The cut off point for stakeholders' diverging index was subjectively selected to be 3.5 implying that means below 3.5 were considered poor and equal or above 3.5 was considered as good. This was then transformed into a dichotomous variable as follows; $< 3.5 = 0$ and $\geq 3.5 = 1$

The dependant variable resource use conflicts Yj denoted as 1 if conflict is perceived and 0 if no conflict is reported. In this particular study, the dependent variable was used to assess whether occurrence of resource use conflict is perceived or not (Hosmer and Lemeshow, 2000)

(b) Independent variables of study for Yi and Yj.

The independent variables included in the analysis were Age (A), Sex of respondent (S), Ethnicity (E), Land size (LS), level of education (ED), Household size (HS), Major economic activities of respondents (MEA) and Marital status (MS).

The logistic regression used to represent the linear combination of the variables is shown in equation 1:

$Yi = ß_0 + ß_{i1}X_{i1} + ß_{i2}X_{i2} + ß_{ig}X_{ih}$ ..+ei.....(1)

Where:

Yi = the i^{th} observation value (score) of the linear combination independent variables underlying stakeholders diverging interests in apiculture in the study area, which stands for non-standardized logistic regression equation. This was then used for prediction purposes.

X_1 to X_h = independent variables which include:

A = Age of respondent

S = Sex of respondent

LS = Land size

E = Ethnicity assigned 1 if Wasaamba and 0 if any other tribe.

ED = Education assigned 1 when formal and 0 otherwise.

HS = Household size

MEA = Major economic activities assigned 1 if beekeeping and 0 otherwise.

MS = Marital status of respondent assigned 1if married and 0 otherwise.

β_0 = Constant term of the model without the independent variables.

$ß_{i1}$ …. $ß_{ih}$ = Independent variable coefficients showing the marginal effect of unit change (negative or positive) in the independent variables on the dependant variables.

e = is the base of the natural logarithm (2.718).

z = the combination of the independent variables i.e. $ß_0 + ß_{i1}X_{i1} + \ldots + ß_{ih}X_{ih}$.

i = 1,2……

N (total number of respondents) = Sample size i.e. 98 for this study.

h = Total number of independent variables (h = 8)

Equation 2 was used to calculate the probability of accepting and equation 3 for rejecting the stakeholders diverging interests and for explaining the contribution/s of the independent variables on changes in the independent variables on changes in the dependant variable in the study area.

$$\text{Prob (accepting)} = \frac{(eYi)}{(1+eYi)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

Where $Yi = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_hX_h + \ldots + e_i$

e = 2.71818

The probability of rejecting an approach is given by:

Prob (rejecting) = 1-Prob (Accepting)

$= 1-\frac{(eYi)}{(1+eYi)}$ …… (3)

The hypothesis tested was:-

(Ho): ß = 0 indicating that the regression coefficients are equal to zero implying that no relationship exists between the independent variables (socio economic factors) and dependant variable (stakeholders diverging interests in apiculture in the study area).

(Ha): ß ≠ 0 indicating that the regression coefficients are not equal to zero implying that there is a positive or negative relationship that exists between the independent variables (socio economic factors) and dependant variable (stakeholders diverging interests in apiculture in the study area).

Independent variables of study are factors that affect the perception of conflict with regard to apiculture in the study area. The independent variables included in the analysis were: Age of respondents, level of education, household size, ethnicity, land size, level of interest, and duration of stay.

$Yj = ß_0 + ß_{g1}X_{g1} + ß_{g2}X_{g2} + ß_{g3}X_{g3} + ...+ ß_{g}jX_{g}j$……Equation (4)

Where:-

Yj = perceived conflict

β_0 = constant term of the model without the independent variables.

ßg1 …. ßgj = Independent variable coefficients showing the marginal effect of unit change (negative or positive) in the independent variables on the dependant variables.

e = is the base of the natural logarithm.

j = 1, 2……N (total number of respondents) = Sample size i.e. 98 for this study.

g = Total number of independent variables (g = 7).

X1 to Xg = independent variables which include:-

A = Age of respondent in years

ED = Education assigned 1 when formal and 0 otherwise

HS = Household size

E = Ethnicity assigned 1 if Wasaamba and 0 if any other tribe

DR = Duration of stay in the study area

LS = Land size

LI = Level of interest of respondent assigned 1if interested in apiculture and 0 otherwise.

The hypotheses tested were that:

(Ho): ß = 0 Indicating that socio-economic factors have no influence on perceived conflict in the study area.

Alternative hypothesis

(Ha): ß ≠ 0 Indicating that socio-economic factors have influence (positive or negative) on perceived conflict in the study area.

The hypotheses were tested at 0.05 level of significance. The null hypothesis was rejected when $p > 0.05$ and the alternative hypothesis accepted when $p < 0.05$.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Land Use Setting With Respect to Natural Resource Management (NRM) in Different Agro Ecological Zones (AEZ)

4.1.1 Major land use types and NRM in different AEZs

Table 5 show the major land use types in the study area. Five land use types namely mixed cultivation and settlement (75.74%), natural forests (14.23%), plantation forests (7.0%), Lushoto urban area (1.7%) and valley bottoms cultivation (1.33%) were identified in the study area. The results show that mixed cultivation and settlements constituted the dominant land use type in the study area. This type of land use has been associated with extensive deforestation and encroachment of forest resources in Tanzania (Wily and Dewees, 2001; Chamshama and Nduwayezu, 2002; FBD, 2005).

Table 5: Areal extent of major land use types in different AEZs in the study area.

Land use type	**Agro ecological zones (KM^2)**			**Total area (KM^2)**	**Percent area coverage(%)**	**Number of observations**
	Cold humid	**Cold dry**	**Warm dry**			
Natural forests	4,789	227	0.000	5,016	14.23	4
Plantation forests	2,220	248	0.000	2,467	7.00	7
Mixed cultivation and settlements	11,415	13,308	1,986	26,709	75.74	6
Lushoto urban area	599	0.000	0.000	599	1.70	1
Valley bottoms cultivation	0.000	471	0.000	471	1.33	1
Total	**19,023**	**14,254**	**1,986**	**35,263**	**100.00**	**19**

Kaoneka (1993) reported that 75.7% of the West Usambara Mountains (WUMs) in Tanzania was under forestry as the main land use type followed by agriculture which accounted for only 19.7%. Results from this study show severe degradation of forest resources declining to 14.23% from 1993 (Table 5).

Figs 3a - e show NRs which are under pressure in the study area. This could be attributed to different stakeholders' interests on the use and management of natural resources. It is observed from the results that fuel wood, logging and uncontrolled fires are the major causes of forests and land degradation including severe soil erosion. These findings are consistent with those of Kaoneka and Monela (2000), Shemdoe (2002) and Mowo *et al*. (2002) who observed that extensive deforestation and encroachment on marginal lands has led to reduction in land cover and widespread run off and erosion in the West Usambara Mountains (WUMs) accelerated by diverse needs for forest services (fuel-wood charcoal production and commercial logging) and land for settlement and agricultural expansion. Makundi *et al.* (2006) and Hubeau (2010) in their studies in WUMs documented that most changes of the present and recent past are due to human actions resulting from uses of land for cultivation and settlement. The authors also observed that land use and land cover changes are largely driven by the need to meet the ever increasing household basic needs (energy and food) of the human population. According to Hubeau (2010), changes in population density may affect land use choices by increasing the scarcity of land relative to labour which creates pressure on natural resources.

Figure 3 a: Encroachment of forest resources due to mixed cultivation and settlement in Magamba Forest reserve, Lushoto, Tanzania

Figure 3 b: Poor farming practises along Umba River bank in Mwangoi village, Lushoto, Tanzania.

Figure 3 c: **Effect of bush fires on the vegetation cover of West Usambara Mountains.**

Figure 3 d: **Rampant bush fires in forest plantation in Magamba area, Lushoto, Tanzania.**

Figure 3 e: **Settlements on hill tops and valley bottoms in Lukozi / Mnadani in the cold dry zone, Lushoto, Tanzania.**

4.1.2 Status of apiculture with respect to land use types in different AEZs

Table 6, Fig. 4 and Fig. 5 summarize the spatial distribution of beehives identified in different land use types and across various AEZs in the study area. The majority of beehives (84% and 73%) are located on mixed cultivation and settlements in the cold dry zone and warm dry zones respectively, followed by natural forests (61%) in the cold humid zone (Table 6 and Fig. 5).

Table 6: Distribution of beehives in different land use types and AEZs in the study area

AEZ	Land use types	No of sampled beehives	Type of beehives used	
			Traditional	Improved
Warm dry zone	-Mixed cultivation and settlements	27 (73)	-	37(100)
	- Natural forests	10 (27)		
Cold dry zone	-Natural forests	31(16)	88(45.6)	105(54.4)
	-Plantation forests	-		
	-Mixed cultivation and settlements	162 (84)		
	-Valley bottoms cultivation	-		
Cold humid zone	-Natural forests	85 (61)	2(1.4)	138(98.6)
	-Plantation forests	6 (4)		
	-Mixed cultivation and settlements	38 (27)		
	-Lushoto urban area	11(8)		
Total		**370 (100)**	**90(24.3)**	**280(75.7)**

Numbers in brackets denote percentages

This is an interesting scenario in that if apiculture is intensified in mixed cultivation and settlement type of land use, it has potential of increasing crop production through pollination by bees. According to Verma (1990), Nel *et al*. (2000) and Lietaer (2009), diversification of productive activities on a given piece of land to include apiculture is certainly beneficial to ecology through the encouragement of enhanced plant pollination and the conservation of indigenous bee forage plants.

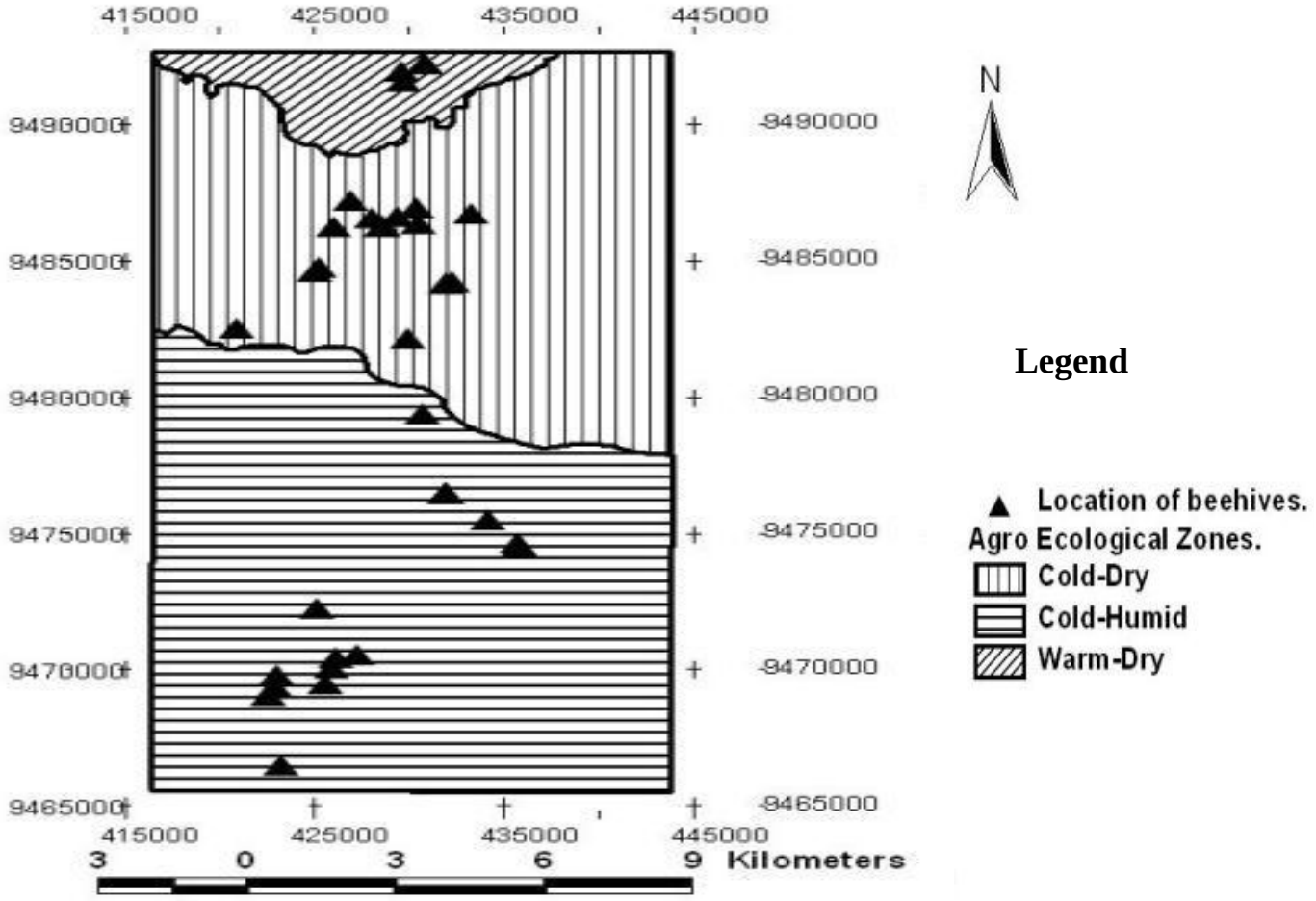

Figure 4: **Location of beehives in the different Agro-Ecological Zones.**

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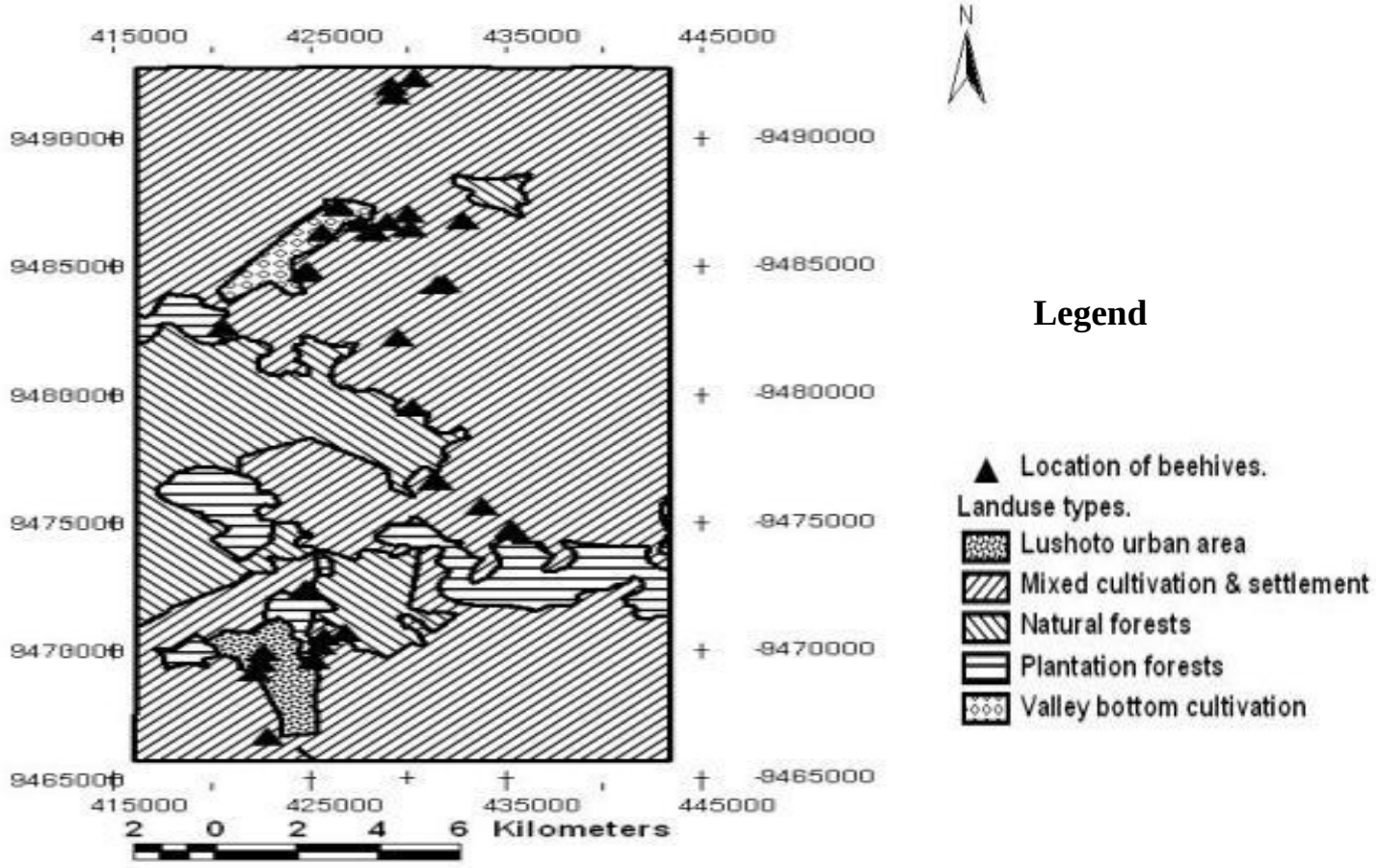

Figure 5: Location of beehives in different land use types.

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Nel *et al*. (2000) indicated further that the value of apiculture is particularly apparent in areas where there is pressure on land resources owing to population growth and the associated excessive subdivisions of land.

The Availability of bee fodder, water and market accessibility are key characteristics of the studied zones which have been reported by many authors as important features for apiculture development (Agrawal, 2001; Oluwatusin, 2008; Ejigu *et al*., 2009). Patches of forest reserves and relatively permanent water resources and diverse fruit trees are abundant in the cold dry and cold humid zones of the study area. The findings of this study concur with those of IPMS (2005) in Ethiopia which documented that about 70% of the bee fodder requirements for honey bees were derived from the natural forests and forest reserves which correlated with number of beehives sited in the area by beekeepers.

4.2 Stakeholders Identification and their Interests with Respect to Apiculture and Natural Resource Management (NRM)

4.2.1 Type of stakeholders and their involvement in apiculture

Table 7 presents the list of various stakeholders and how they are involved in apiculture as identified in the study area. The main stakeholders identified include small scale farmers; farmer groups; research and training organizations; Faith Based organizations (FBOs); local government and sectorial government ministries (Ministries of Local Government, Agriculture, Livestock, Natural Resources, Trade and industry and Irrigation).

Table 7: Type of stakeholders in apiculture natural resource management in the study area.

Type of stakeholders	Number	Percentage (%)	Stakeholders involvement in apiculture
1. Small scale farmers	74	84.10	-Cultivation and beekeeping for income generation. -Forest services -Beekeeping for conservation of natural resources.
2. Small scale farmer groups	4	4.55	-Cultivation and beekeeping for income generation. -Forest services -Beekeeping for conservation of natural resources.
3. Faith based organisations (Lutheran and Catholic churches)	3	3.40	-Beekeeping for conservation of natural resources and biodiversity. -Buying, processing and marketing.
4. Research and Training organisations	3	3.40	-Research in natural resources , governance and capacity building (Training of Trainers)
5. Local government	-		-Revenue collection, Sustainable use of natural resources, Protection, Conservation, Regulatory
6. Sectorial Government Ministries (Agriculture, Natural resources, Irrigation, Trade).	4	4.55	-Regulatory (Policy and legislations).
7. Beehive makers	-		-Marketing beehives
8. Traders	-		-Marketing honey
9. Traditional healers	-		-Medicinal collection and selling
10. Soap and candle makers	-		-Marketing bee products
Total	**88**	**100.00**	

Other stakeholders though not very active in the area include Non-Governmental Organisations (NGOs), traditional healers, traders, beehive makers and soap and candle makers. The identified stakeholders fall within the premise of the stakeholders defined in the Tanzanian National Beekeeping Policy (MNRT, 1998), National Forest Policy (MNRT, 1998) and National Beekeeping Programme (MNRT, 2001). These policy documents underscore the importance of stakeholders in apiculture in Tanzania particularly in supporting livelihoods of communities and economic development of the country (Mwakatobe and Mlingwa, 2005; Lalika and Machangu, 2008).

The results in Table 7 show that small scale farmers form the majority of the stakeholders (84%). They are involved in many activities including crop cultivation and apiculture for income generation and to a lesser extent for conservation of natural resources. On the other hand, the small scale farmer groups and FBOs are actively involved in apiculture for income generation and conservation of natural resources. The sectoral government ministries and local government play an active role as regulatory and in some cases as facilitators. From these results, it is apparent that all the identified stakeholders involved in apiculture have diverse interests including natural resource conservation and livelihood. According to TNRF (2009), the success of any natural resource management programme will only be achieved if livelihoods and economic development are guaranteed.

In Botswana, Community Based Natural Resource Management Support Programme (CBNRM) offers a framework for involving stakeholders with divergent interests in natural resource use and access (USAID, 2009). Renard (2004) in his study in the

Caribbean reported that identification of the full spectrum of stakeholders with different interests in transforming natural resources is vital. Renard (2004) further emphasized that to ensure full involvement in natural resource management initiatives, all stakeholders at community level need to be educated and sensitized about their rights, responsibilities and expected returns. Thus, stakeholders' interests with respect to natural resource management can provide useful guidelines for policy formulation in conservation of natural resources.

4.2.2 Stakeholders interests in apiculture and NRM in the study area

Table 8 presents the list of various stakeholders and their respective interests in apiculture. The stakeholders have multiple interests ranging from natural resource use, conservation, income generation, medicinal collection and selling, accessibility to land for cultivation and forest services. The results show that the majority of small scale farmers who constitute 73% were involved in apiculture with economic focus as their primary interest. On the other hand beekeeping groups constituting 10% of the stakeholders in apiculture showed high interest in both economic and conservation of natural resources followed by faith based organizations (7%). For example, MWAMBOA and TAMILWAI beekeeping groups in Mwangoi and Migambo villages, Lushoto District, Tanzania were practising beekeeping with the central. Objective of conserving river banks and water sources respectively while at the same time aiming at income generation (Fig. 6a - c). The stakeholders interests observed in Mwangoi and Migambo villages were similar to those described by Woodcock (2002) in the Eastern Arc Mountains, Tanzania, who noted that stakeholders' interests in natural resource management were influenced by economic

Table 8: Types of interests by various stakeholders in apiculture in the study area.

Stakeholder	Number	Percentage (%)	Type of Interest	Nature of beekeeping	
				Traditional	Improved
Small scale individual beekeepers	30	73.0	-Economic (Income generation)	Traditional	Improved
Beekeeping groups -MWAMBOA -TAMILWAI -Asali Yetu Mtumbi -Wafungaji Wanyuki	4	10.0	-Economic (Income generation) -Conservation of natural resources (River bank conservation, Restoration of degraded, lands, Conservation of catchments, water sources) -Food security -Economic (Beehive making, harvesting gears). -Capacity building (Training of Trainers)	Traditional	Improved
FBOs (Catholic and Lutheran churches and Lutheran Irente farm)	3	7.0	-Conservation of natural forest -Biodiversity conservation -Economic (Income generation)	Traditional	Improved
Research and Training Institutions (TAFORI, SEKUCO, ASARECA and Kwemaranba Sec. School.)	4	10.0	-Capacity building (Training of Trainers) -Research and Development of innovative technologies -Conservation of natural forest		
Beehive makers	-		-Economic (Income generation through beehive sells)		
Total	**41**	**100.0**			

TAFORI = Tanzania Forest Research Institute, SEKUCO = Sebastian Kolowe University College and ASARECA = Association for Strengthening Agricultural Research in Eastern and Central Africa.

Figure 6 a: **Beehives installed on degraded water source at Kwaboli by TAMILWAI beekeeping group in 2008, Lushoto district, Tanzania**

Figure 6 b: **Beehives installed on degraded river bank along River Umba in Mwangoi village by MWAMBOA beekeeping group in 2008, Lushoto district, Tanzania.**

Figure 6 c: **Extent of rehabilitation of the degraded river bank along Umba River at Mwangoi after intervention through modern beekeeping by MWAMBOA beekeeping group in 2009.**

demands, livelihood needs, institutional mandate and geographical proximity (adjacency) to the natural resources.

Apiculture in developing countries is commonly viewed as a pro poor income generating activity (Verma, 1990; Ja'afar-Furo, 2007; Lietaer, 2009; FAO, 2009). This fact is attributed to its low startup capital and labour requirements. It is apparent from this study that organizing small scale farmers into beekeeping groups tend to enhance their interests in apiculture as a tool for conservation of natural resources and capacity building (increasing their capacity to train other farmers i.e. Trainers of Trainers) while at the same time providing sustainable alternative livelihood to the communities (Ashby *et al.*, 1989; Verma, 1990; Ranthore and Jain, 2005). Nombo (1995) and Farinde *et al*. (2005b) in their studies in the Uluguru Mountains, Morogoro, Tanzania and Oyo state in Nigeria respectively urged that group setting promotes sharing and exchange of ideas towards problem solving despite individual differences in interests. The authors further pointed out that farmers group approach can provide farmers with strong cohesive leadership over divergent interests.

Advantages of farmer groups were also acknowledged by Sanginga *et al*. (2001) in their study in the highlands of Kabale, Uganda, that Farmers Group Model (FGM) promotes collective learning and exchanges that occur in group settings and ensures that more people participate, through improved dialogue, efficiency in using resources and enhanced linkages. The authors further argued that capacity building and competence development of groups creates immediate interests of the people to participate in natural resource management initiatives. Therefore, mobilizing small scale farmers into farmer groups tend to reduce stakeholders' divergent interests

leading to enhanced participation in natural resource management as it were observed in Mwangoi and Migambo villages in Lushoto District, Tanzania (Fig. 6a-c).

Table 8 shows that research and training institutions (TAFORI, SEKUCO, SUA - ASARECA) and schools including Kwemaramba secondary school and faith based organizations (Rosminian and Mnadan Catholic and Lutheran church at Irente farm, SEKUCO) were more interested in the conservation of natural resources, development of technological innovations and capacity building. The results could be explained by the fact that these stakeholders have institutional mandates which enhance their interests to complement sectoral government efforts towards natural resource conservation and improved peoples' livelihoods (NBP, 1998; NFP, 1998; Woodcock, 2002; MNRT, 2003).

4.3 Factors Influencing Stakeholders' Diverging Interests in Apiculture in the Study Area.

Table 9 presents the results on key factors influencing stakeholders' diverging interests in apiculture in the study area. The results indicate that household size, level of education, marital status and major economic activities had significant ($p < 0.05$) influence on stakeholders' diverging interests in apiculture while age, sex and ethnicity were not significant ($p > 0.05$).

Table 9: Factors influencing stakeholders' diverging interests in Apiculture in the Study area.

Variable	B	S.E.	Wald	df	Sig.	Exp(B)
Household size	1.573	0.567	7.692	1	0.006*	4.821
Level of education	0.344	0.134	6.576	1	0.010*	1.411
Marital status	3.097	1.219	6.460	1	0.011*	22.133
Major economic activities	2.440	1.117	4.768	1	0.029*	11.471
Age	0.411	0.256	2.578	1	0.108ns	1.509
Sex	0.632	0.530	1.422	1	0.233ns	1.881
Land size	-0.183	0.175	1.091	1	0.296ns	0.833
Ethnicity	-0.964	0.669	2.079	1	0.149ns	0.381
Constant	-7.097	1.813	15.328	1	0.000*	0.001

- * Significant at $p < 0.05$; Ns Not significant at $p < 0.05$

4.3.1 Household size

The results show that household size is statistically significant and positively correlated with stakeholders' diverging interests in apiculture. The result implies that a unit increase in household size increases the stakeholders' diverging interests by a multiplicative factor of 4.821 (Table 9). In other words, the larger the household size the higher the chances that members of the household would develop diverse interests in various livelihood strategies. This factor is thus likely to contribute positively to apiculture and hence natural resource management due to the fact that apiculture has an economic incentive (Mwakatobe and Mlingwa, 2005; Lalika and Machangu, 2008). As observed in this study, the majority of the respondents (about 74%) had household sizes between 5 – 9 persons (Table 10).

Table 10: Land and household size in distribution in various Agro-ecological zones in the study area.

Land size (ha)	**Number of respondents per Agro Ecological Zone**			
	Cold humid	**Cold dry**	**Warm dry**	**Total N = 98**
	N = 36	**N = 32**	**N = 30**	
< 0.5	4 (11.11)	3 (15.62)	8 (26.7)	15 (15.3)
0.5 - 0.9	11 (30.55)	3 (15.62)	10 (33.33)	24 (24.5)

1 - 1.49	5 (13.88)	6 (18.75)	4 (13.33)	15 (15.3)
1.5 - 1.9	7 (19.44)	6 (18.75)	5 (16.67)	18 (18.4)
2 - 4	6 (16.67)	9 (28.1)	3(10.0)	18 (18.4)
> 4	1 (2.78)	4 (12.50)	0 (0)	5 (5.1)
N/a	2 (5.56)	1(3.12)	0 (0)	3 (3.1)
Total	**36 (100)**	**32 (100)**	**30 (100.0)**	**98 (100.0)**
Household size				
less than 5	9 (25)	9 (28.1)	3(10.0)	21 (21.4)
5 - 9	23 (63.9)	22 (68.7)	27 (90.0)	72 (73.5)
10 - 14	3 (8.3)	0 (0)	0 (0)	3 (3.1)
15 and above	1(2.8)	1(3.1)	0(0)	2 (2.0)
Total	**36 (100.0)**	**32 (100.0)**	**30 (100.0)**	**98 (100.0)**

Note: Numbers in brackets denote percentages.

Mean household size in the surveyed communities was 5.6, 6.0 and 6.5 for cold humid, cold dry and warm dry respectively (Table 11) which were higher than the national average of 4.9 and 4.7 in 2002 and 2006 respectively (Tanga Regional Socio-Economic Profile (TRSE), 2008).

Table 11: Household size in the various agro-ecological zones.

	Agro-ecological zones		
Household size	**Cold humid**	**Cold dry**	**Warm dry**
Mean	5.6	6	6.5
Minimum	1	1	1
Maximum	11	18	9

Increased human population increases demand for different goods and services from natural resources (MNRT, 2003; Sumbi, 2004). Therefore, this is likely to motivate rural communities to engage and develop interests in various income generating economic activities including apiculture as an incentive towards conservation of natural resources (Verma, 1990; Lalika and Machangu, 2008).

Increased household size also has implications on the available land for various income generating economic activities. Land scarcity is a common feature in West Usambara Mountains, Lushoto, Tanzania (Kaoneka, 1993; Mowo *et al*., 2002; Hubeau, 2010). Increased household size is likely to exert pressure on the utilization of land resources due to diverse interests in economic activities. Table 11 shows land and household size as reported by respondents in various agro-ecological zones. The majority of the respondents (24.5%) had land sizes ranging from 0.5 to 0.9 ha. It is apparent that communities' interests in apiculture is likely to increase with increasing household size since apiculture as an activity is relatively less land resource demanding. These results concur with Verma (1990) and Solomon (2007) who noted in India and Nepal and Ethiopia that apiculture can be practised by landless households as it requires small land sizes. According to Eboh (2000) and Njuki (2004), land use related rights play a crucial role in determining the use and sustainable management of natural resources, since they specify access to the land, the resources on it and the rights of using them. Eboh (2000) in his study in Eastern Nigeria argued that since increased tenure security is often linked to sustainable farming practices; it is also likely to promote natural resource management. It is assumed that people are only willing to invest their scarce resources if they know that, ultimately they will reap the benefits. Availability of land is one of the determining factors to the success of management activities such as tree planting and contour farming. Farmers with land size available only for agricultural crops are normally reluctant to plant nectar rich trees (Njana, 1998; Mbwambo, 2000). Kallonga *et al*. (2003) reported that women consistently lack access to tenure of land and other natural resources. Women's rights to land ownership are often prohibited

by state laws and traditional norms. Therefore, when women do not have control over natural resources, they lack the interest and confidence to conserve them.

4.3.2 Level of education

Table 9 shows that level of education was positively correlated with stakeholders' diverging interests in apiculture and statistically significant at $p < 0.05$. This implies that a unit increase in level of education of respondents increases stakeholders' diverging interests by a multiplicative factor of 1.411. In this study, the majority of respondents (87.2%) had attained primary education while those with secondary and tertiary education constituted 6.1% and 3.1% respectively (Table 12).

Increase in the level of education of the communities has been reported in many studies to be associated with increase in the awareness of the communities' natural

Table 12: Distribution of respondents by level of education in various Agro-ecological zones.

Level of education	Agro –ecological zones			
	Cold humid	**Cold dry**	**Warm dry**	**Total**
No formal education	1(2.8)	0	2(6.7)	**3(3.1)**
Primary	27(75)	32(100)	27(90)	**86(87.7)**
Secondary	5(13.9)	0	1(3.3)	**6(6.1)**
Tertiary	3(8.3)	0	0	**3(3.1)**
Total	**36(100)**	**32(100)**	**30(100)**	**98()**

Note: Numbers in brackets denote percentages.

resource management attributed to the development of diverse interests in livelihood activities that have positive outcome to natural resource management (Kajembe, 1994; Katani, 1999; Mbwambo, 2000; Mbwilo, 2002).

Education is an important factor in development as it determines which livelihood activities a household is likely to develop interests. For example, Katani (1999) in his study in Mwanza District, Tanzania documented that increase in level of education increases the interest and willingness of local communities to participate in natural resource management such as tree planting and contour farming. It is assumed that respondents with higher level of education have greater exposure and are more likely to engage in more livelihood activities including apiculture compared to less educated ones. Mbwambo (2000) in a study conducted in Udzungwa Mountains, Iringa District, Tanzania, further argued that education has a direct influence on people's interests in natural resources management. Research conducted in Shinyanga, Tanzania by Maro, (1995) contended that education plays a major role in the socio economic development of the society. Balogun (2000) in Nigeria indicated that education is positively related to adoption of innovation including integrating

apiculture on farmlands using improved beehives. The findings also confirm previous studies by Kajembe (1994) and Mbwilo (2002), who reported level of education to affect the adoption of new land use and management techniques.

4.3.3 Marital status

The results in Table 9 show that marital status of the respondents was positively correlated with stakeholders' diverging interests and was statistically significant at $p < 0.05$. In this study, the majority of the respondents (91.8%) were married households while 6.1%, 1% and 1% were single, divorced and widowed respectively (Table 13).

Table 13: Distribution of respondents by marital status in various Agro-ecological zones.

Marital status	Agro-ecological zones			Total
	Cold humid	**Cold dry**	**Warm dry**	
Married	30(83.3)	31(96.9)	29(96.7)	90(91.8)
Single	4(11.1)	1(3.1)	1(3.3)	6(6.1)
Divorced	1(2.8)	0	0	1(1.0)
Widowed	1(2.8)	0	0	1(1.0)
Total	**36(100.0)**	**32(100.0)**	**30(100.0)**	**98(100.0)**

Note: Numbers in brackets denote percentages

The results presented in Table 9 imply that increasing the marital status of stakeholders by one unit increases stakeholders' diverging interests by a multiplicative factor of 22.133 and vice versa. The plausible explanation is that married households have larger families which call for household heads to look for more basic needs (Kessy, 1998). This in turn calls for households to explore and expand their interests in diverse livelihood activities which may include apiculture.

Mayeta (2004) reported that marital status influences decision making at the household level, including the use of natural resources.

4.3.4 Major economic activities

Results presented in Table 14 show the primary and secondary economic activities undertaken in the study area. The majority of respondents were small scale farmers (19 - 35%) who according to this study were more interested in annual cropping and vegetable production while only 7.14% and 12.24% were interested in apiculture as their primary and secondary economic activities respectively. The results in Table 9 show that major economic activities were positively correlated to stakeholders' diverging interests and were statistically significant at $p < 0.05$. According to the results, increasing major economic activities by one unit is likely to increase stakeholders' diverging interests by a multiplicative factor of 11.471. In the study area, major economic activities include annual cropping, vegetable production and livestock farming and apiculture. Given the nature of economic activities and the land scarcity situation in the study area, increased multiple interests in major economic activities is likely to exert pressure on natural resources including land, water and forests (Mowo *et al*., 2002).

Introduction of modern beekeeping by SUA – ASARECA project is an innovative technological intervention that is likely to influence communities' multiple interests in major economic activities towards conservation of natural resources (Blomley, 2003; ASARECA, 2009). Developing the interests of communities in apiculture is

Table 14: Major economic activities reported by various respondents in the study area.

Economic activity	Primary economic activities		Secondary economic activities	
	No of respondents	**Percentage (%)**	**No of respondents**	**Percentage (%)**
Annual cropping	34	34.69	20	20.41
Fruits production	0	0	13	13.27
Vegetable production	25	25.51	19	19.39
Dairy farming	6	6.12	10	10.20
Carpentry	1	1.02	0	0
Apiculture	**7**	**7.14**	**12**	**12.24**
Employee	13	13.27	1	1.02
Business	8	8.16	2	2.04
Fishing	0	0	0	0
Poultry	0	0	1	1.02
None	4	4.1	20	20.4
Total	**98**	**100.0**	**98**	**100.0**

likely to contribute towards a win –win scenario that meet both social economic demands and conservation of natural resources (Kimaro *et al.*, 2010).

4.3.5 Age

Age of respondents (Table 9) was a positively correlated to stakeholders' diverging interests but was not statistically significant at $p < 0.05$. However, the results imply that increasing age of respondents by one year increases the chances of stakeholders diverging interests by a multiplicative factor of 1.509 and vice versa. In this study, age ranged between 18 and 77 years with mean age of 43.6 ±1.12 (SE) years. The plausible explanation is that the older a person is the more chances he/she shows diverse interests in natural resource management (Singh *et al*., 2003). It is most likely that the older villagers have accumulated experience and knowledge on different aspects of natural resource management and hence are more likely to engage into apiculture for both economic and conservation purposes. These results are consistent with the study by Kajembe and Mwihomeke (2001) in Handeni

district, Tanzania who reported that elders were able to judge judiciously the need to conserve natural resources unlike the young ones whose major interest was to gain quick economic benefits from natural resources at the expense of conservation. Age was also identified by Singh *et al*. (2003) in his study in India to have significant effect on experience, wealth and decision making and hence can influence individual interests.

4.3.6 Sex of respondents

Distribution of respondents by sex in the different agro ecological zones in the study area is presented in Table 15. The results indicate that the majority of respondents (66.3%) were males while females were only 33.7%.

Table 15: Distribution of respondents by sex in different agro ecological Zones

	Number of respondents in Agro Ecological Zones			
Sex	**Cold humid**	**Cold dry**	**Warm dry**	**Total**
Female	15 (41.7)	6 (18.8)	12 (40.0)	33 (33.7)
Male	21(58.3)	26 (81.2)	18 (60.0)	65 (66.3)
Total	**36 (100.0)**	**32 (100.0)**	**30 (100.0)**	**98 (100.0)**

Numbers in brackets denote percentages

From Table 9, the results showed that sex of respondents positively correlated to stakeholders' diverging interests though not statistically significant at $p < 0.05$. It implies that for every increase in maleness (dominant sex in the study area) the level of stakeholders' divergent interest in apiculture tends to increase by a multiplicative factor of 1.881. Participant observations in the field showed that women have less interest in apiculture because they are constrained by cultural values. Field observations showed further that gender balance is not given due consideration hence

poor women participation in apiculture with poor interests in beekeeping and conservation of natural resources by women (Sumbi, 2004).

A study conducted by Robinson (2006) covering six regions (Iringa, Arusha, Tanga, Kilimanjaro, Lindi and Mbeya) in Tanzania to assess stakeholder knowledge, awareness and perception on participatory forestry management revealed that women were less interested than men. These findings reflect the different interests' men and women have towards natural resource management. As pointed out by Kessy (1998), in his study in East Usambara Mountains, Tanzania, gender dimensions reflects clear gender roles which exclude women in some activities like beekeeping.

4.3.7 Ethnicity

Table 16 shows the distribution of dominant ethnic groups in different agro ecological zones in the study area. The results show that 74% of the respondents were Wasambaa. However, the composition varied significantly at 5% level of probability in terms of ethnic groups. In cold humid, cold dry and warm dry zones, the Wasambaa comprised of 66.7%, 59.4% and 96.7% respectively (Table 16). The cold humid zone however, showed the most diversified ethnic composition in the study area suggesting the urban nature of the Lushoto urban in the study area (Table 16). The Wasambaa are predominantly peasant farmers whereas the Wapare and Wambugu are agro-pastoralists (Samantha, 2010; Hubeau, 2010).

Table 16: Dominant ethnic groups in different agro ecological zones in the study area.

Ethnicity	Agro Ecological Zones			Total
	Cold humid	Cold dry	Warm dry	
Wasambaa	24 (66.7)	19 (59.4)	29 (96.7)	72 (74)
Wapare	3 (8.3)	6 (18.7)	0	9 (9)

Wambugu	2 (5.5)	7 (21.9)	0	9 (9)
Chaga	4 (11.1)	0	0	4 (4)
Mzigua	0	0	1 (3.3)	1 (1)
Hangaza	1 (2.8)	0	0	1 (1)
Mnyakusa	1 (2.8)	0	0	1 (1)
Mbondei	1 (2.8)	0	0	1 (1)
Total	**36 (100.0)**	**32 (100.0)**	**30 (100.0)**	**100.0**

Numbers in brackets denote percentages

The study also showed that ethnicity was negatively correlated with stakeholders' diverging interests. This implies that decreasing ethnicity by one unit would decrease stakeholders' diverging interests by a multiplicative factor of 0.381 (Table 9).The plausible explanation is that the fewer the ethnic groups in an area the less the stakeholders' divergent interests due to ethnicity. In other words, smaller ethnic groups are likely to enhance knowledge sharing and interactions among the stakeholders with diverging interests. Hubeau (2010) in her study in West Usambara Mountains, Tanzania, observed that the Wasambaa, Wapare and Wambugu live in harmony and trade among each other and that intermarriage are also quite common. This therefore moderates stakeholders divergent interests as the various ethnic groups learn from each other. Maro (1995) in his study in Shinyanga, Tanzania, argued that different ethnic groups have different norms and cultural interests toward the use and management of natural resources. Figure 7 shows the spatial distribution

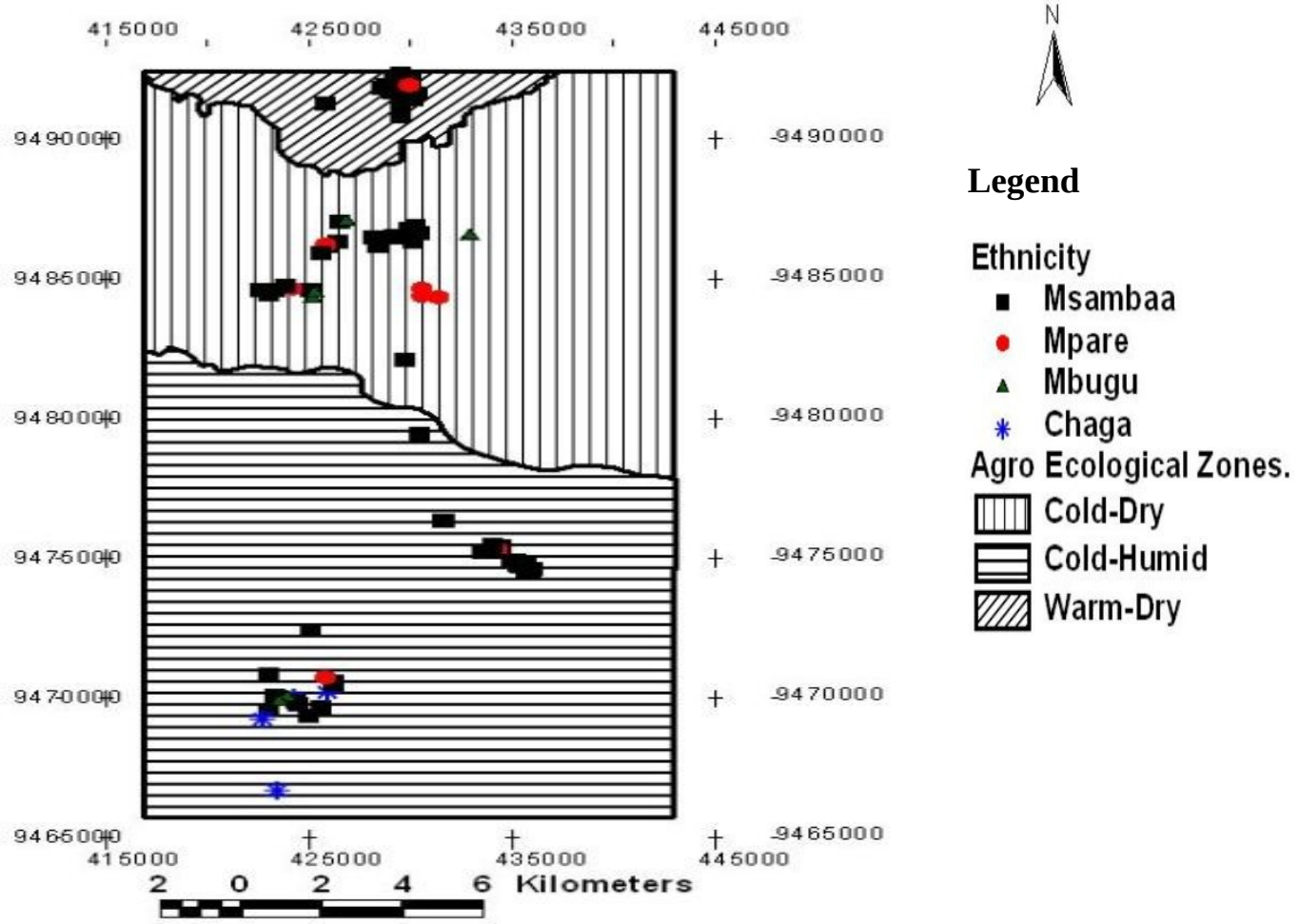

Figure 7: Spatial distribution of respondents' ethnicity in various Agro ecological Zones in the study area

106

106

101

Legend

of the dominant ethnic groups in the study area. It is apparent from Fig. 7 that Wasaamba are dominantly present in all the three agro-ecological zones.

4.4 Types of Resource Use Conflicts Prevalent in Apiculture in the Study Area

4.4.1 Resource use conflicts

Table 17 and 18 show the types of resource use conflicts prevalent in apiculture in various agro-ecological zones in the study area. The results show that the conflict between beekeepers and other farmers was the most prevalent accounting for 74.2% and 57.4% out of 98 (Total number of interviewed respondents) and 54 (Total number of interviewed beekeepers) respectively (Table 17). Other reported conflicts were between beekeepers and their neighbors (16.1 %), individuals and beekeeping groups (6.5%) and individuals within the beekeeping groups. The results show that about 32% of the respondents interviewed were aware of the resource use conflicts between beekeepers and their fellow farmers in the studied zones (Table 18). The resource use conflicts were predominant in the cold dry zone (44%) followed by the cold humid zone (36%) and warm dry zone (13%) respectively (Table 18). This suggests that there are more conflicts when beekeepers operate as individuals rather than groups.

The type and level of resource use conflicts in the study area were identified with reference to categories of stakeholders involved as illustrated by Grimble and Wellard (1997) and also demonstrated by Warner (1998), Kaoneka and Monela (2000) and Mbeyale (2009). According to the authors, the type of resource use

conflicts in the study area fall in the category of inter micro – micro conflicts involving people from within the same community i.e. beekeepers and other farmers,

Table 17: Types of resource use conflicts prevalent in apiculture in various agro- ecological zones in the study area.

Agro Ecological Zone	Type of resource use conflicts				Total
	Beekeepers and fellow farmers	**Individuals and beekeeping groups**	**Beekeepers and neighbors**	**Beekeepers and middle men**	
Cold humid	7(58.3)	1(8.3)	4(33.3)	-	**12(100)**
Cold dry	14(93.3)	-	1(6.7)	-	**15(100)**
Warm dry	2(50)	1(25)	-	1(25)	**4(100)**
Total	**23(74.2)**	**2(6.5)**	**5(16.1)**	**1(3.2)**	**31(100)**

Numbers in brackets denote percentages

Table 18: Awareness on resource use conflicts by respondents in different Agro- Ecological zones

Awareness of conflicts	Agro Ecological Zone			Total N = 98
	Cold humid N = 36	**Cold dry N = 32**	**Warm dry N = 30**	
Yes	13(36.1)	14 (43.7)	4 (13.3)	31 (31.6)
No	23 (63.9)	18 (56.3)	26 (86.7)	67 (68.4)

Numbers in brackets denote percentages

beekeepers and their neighbours and farmers and middlemen. These conflicts basically occur and arise out of jealous. Resource use conflicts often emerge because stakeholders have different interests for natural and cultural resources (Dorcey, 2004; McCall, 2004; Matthias, 2005). Decisions on land use development taken by stakeholders with different interests in most cases create conflicts in utilization and conservation of natural resources (Mnzava and Riihinen, 1989; Amler *et al*., 1999; Blomley, 2003; Sanginga *et al*., 2007).

4.4.2 Causes of resource use conflicts

Table 19 presents the responses of the interviewed respondents regarding the major causes of resource use conflicts in apiculture in the study area. The respondents indicated that quick financial gains by the poor was ranked the highest (41.4%) followed by uncontrolled bushfires (27.6%) and jealous (22.6%) respectively. Other causes reported include cutting of poles where beekeepers have placed the beehives (10.3%) and mistrust (6.8%) within the group members (Table 19) and age differences (Table 20). FBD (2005) identified use of fire in farm clearing and honey collection as the major cause of most fires in the Eastern Arc Mountains which includes the West Usambara Mountains.

Table 20 show the perception of respondents on resource use conflicts by age in the study area. A larger proportion of the respondents (51.6%) who perceived conflict are between the ages of 40 and 49 years old, indicating that the majority of the community members were within the category Banmeke and Olowu (2005) termed as those eager to learn new innovations followed by age groups 50-59 years (25.8%) and 30-39 years (9.7%) respectively. Comparatively, the age groups falling between 30-59 years perceived more resource use conflicts than those aged 60 years and above implying that different age groups respond differently to natural resource use. It can be concluded therefore, that as one grows older they tend to avoid and or accommodate conflict/s with their neighbors. Malugu (2007) argued that older people are more open- minded and often, express the need to have the natural

Table 19: Respondents' awareness on the causes of resource use conflicts in the study area.

Agro ecological zone	Jealous	Uncontrolled bush fires	Cutting of poles in apiaries	Quick financial gain	Mistrust	Total
Cold humid	5 (16.1)	-	-	7 (24.1)	1 (3.2)	12 (38.7)
Cold dry	-	8 (27.6)	3 (10.3)	4 (13.9)	-	15 (48.4)
Warm dry	2(6.4)-	-	-	1 (3.4)	1 (3.2)	4 (12.9)
Total	**7 (22.6)**	**8 (27.6)**	**3 (10.3)**	**12 (41.4)**	**2 (6.4)**	**31 (100)**
Rank	**3**	**2**	**4**	**1**	**5**	

Numbers in brackets denote percentages

Table 20: Perception of respondents on resource use conflicts by age in the study area

Perception of respondents on resource use conflicts by age			
Age of respondents	**Number and percentage**		**Total**
	YES	**NO**	
<20	0(0)	1(1.5)	1(1.02)
20-29	2(6.4)	10(14.9)	12(12.24)
30-39	3(9.7)	21(31.3)	24(24.50)
40-49	16(51.6)	17(25.4)	33(33.70)
50-59	8(25.8)	16(23.9)	24(24.50)
60+	2 (6.4)	2(3.0)	4(4.1)
Total	**31(100.0)**	**67(68.4)**	**98(100)**

resources conserved, unlike the youth whose major interest is to create immediate economic benefits out of the natural resources.

The use of resources is susceptible to conflicts for a number of reasons. Findings from previous studies show that institutional arrangements, policies, poverty and general awareness on both users and authorities are the major reasons for resource use conflicts (Warner, 2000, Mbeyale, 2009). According to Maganga *et al.* (2002) and Sanginga *et al*. (2007), the multiple nature of resource use conflict call for a

pluralistic approach that recognizes the multiple perspectives of stakeholders and the effects of diverse interests in natural resource use.

4.4.3 Socio-economic factors influencing resource use conflicts in apiculture in the study area

Table 21 shows the influence of socio-economic factors on resource use conflicts in apiculture in the study area. The results show that the level of interest in apiculture, age and duration of stay in the area had significant influence on resource use conflicts in the study area at 5% and 10% probability levels while level of education, ethnicity, household size and land size were not.

Table 21: Factors influencing occurrence of resource use conflicts in the study area

Variable	B	S.E.	Wald	df	Sig.	Exp(B)
Level of interest in apiculture	1.920	0.885	4.712	1	0.030*	6.822
Age	-1.212	0.565	4.596	1	0.032*	0.298
Duration of stay	0.863	0.501	2.973	1	0.0850**	2.371
Level of education	-0.154	0.130	1.405	1	0.236	1.166
Ethnicity	-0.610	0.568	1.151	1	0.283	0.543
Household size	-0.282	0.425	0.440	1	0.507	0.754
Land size	0.100	0.166	0.363	1	0.547	1.105
Constant	1.285	1.498	0.736	1	0.391	3.614

- * Significant at $p < 0.05$; ** Significant at $p < 0.10$

4.4.3.1 Level of interest by respondents in apiculture

Table 22 shows the distribution of respondents by level of interest in practising apiculture in the study area. The results show that the majority of respondents (77.6%) had high interest in practising apiculture while 22.4% had low interest. The chi-square test indicated that the level of interest in apiculture by respondents was significantly different ($p < 0.05$) among the studied agro ecological zones (chi-square

value = 10.264, df = 2, p = 0.006). The results indicate further that 96.8% of the respondents had high level of interest in practicing apiculture in the cold dry zone compared to 69.4% and 66.7% in the cold humid and warm dry zones respectively.

Table 22: Distribution of respondents by level of interest in apiculture

	Agro-ecological zones			
Level of interest	**Cold humid**	**Cold dry**	**Warm dry**	**Total**
Low	11(30.6)	1(3.2)	10(33.3)	22(22.4)
High	25(69.4)	31(96.8)	20(66.7)	76(77.6)
Total	**36(100)**	**32(100)**	**30(100)**	**98(100)**

Numbers in brackets denote percentages

The study also showed that the level of interest in apiculture by respondents was positively correlated with resource use conflicts and was statistically significant at p < 0.05 (Table 21). This implies that increasing the level of interest of communities by a unit is likely to increase the likelihood of resource use conflicts by a multiplicative factor of 6.822. The plausible explanation is that apiculture is a land use type that has economic interest and likely to compete with other land uses in the study area e.g. vegetable production, livestock farming and annual cropping hence source of resource use conflicts. For example, increasing the number of beehives requires more land which may also be of interest to other competing land uses such as annual cropping or livestock farming. Similarly increasing the number of beehives in the valley bottoms is likely to increase resource use conflicts with vegetable producers due to bee stings.

Participant observations show that beekeepers have medium and long term goals motivated by both economic and conservation interests. On the other hand, the non-

beekeepers have short term quick economic interest which may include stealing honey from beehives leading to escalation of resource use conflicts. This probably explains why the conflict between beekeepers and fellow farmers is the most prevalent in the study area. It has been reported in the study area that this scenario was experienced in Migambo village, Lushoto, Tanzania where honey was stolen and beehives destroyed (Migambo Village Chairperson, Personal communication). It was also observed that locating beehives on farmlands in some cases lead to conflict between beekeepers and their neighbours in the event of bee stings.

4.4.3.2 Age of respondents

Age of respondents was positively correlated with resource use conflicts and was statistically significant at $p < 0.05$ (Table 21). It implies that increasing age of respondents by one unit i.e. one year is likely to reduce resource use conflicts in the study area. The plausible explanation is that increasing the age of individuals in the community enhances the chances of wise long term interests in sustainable natural resource use and livelihood. Sumbi (2004) in a study conducted in Udzungwa Mountains, Tanzania, indicated that resource use conflicts decreased with increased age. Note however, that these results do not explain inter-generational conflicts as reported by Kajembe and Mwihomeke (2001) in Handeni, Tanzania, that inter-generational conflicts occur between elders who impose restrictions on the young generations in the utilisation of natural resources. The fact is that the young generations prefer to cut poles for construction of their houses and selling forest products for quick economic gains unlike elders who prefer protecting and conserving the natural resources.

4.4.3.3 Duration of residence of respondents in the area

Table 23 shows the distribution of respondents according to duration of residence in years in different Agro-ecological zones in the study area. The results show that about 32% of the respondents had lived in the respective agro-ecological zones between 40 – 49 years followed by 24.5% (30 – 39 years) and 22.4% (50 – 59 years). The chi-square tests showed that duration of residence of respondents was significantly different at $p < 0.05$ among the studied agro-ecological zones (Chi-square value = 21.102, df = 10, p = 0.020).

Table 23: Distribution of respondents according to duration of stay in years in different Agro-ecological zones in the study area.

	Agro-ecological zones			
Duration of stay in years	**Cold humid**	**Cold dry**	**Warm dry**	**Total**
Less than 20	5(13.9)	0(0)	0(0)	5(5.1)
20 - 29	4(11.1)	3(9.4)	5(16.7)	12(12.2)
30 - 39	9(25)	5(15.6)	10(33.3)	24(24.5)
40 - 49	9(25)	12(37.5)	10(33.3)	31(31.6)
50 - 59	9(25)	8(25)	5(16.7)	22(22.4)
60 and above	0(0)	4(12.5)	0(0)	4(4.1)
Total	**36(100)**	**32(100)**	**30(100)**	**98(100)**

Numbers in brackets denote percentages

The study also showed that duration of residence was positively correlated with resource use conflicts and was statistically significant at $p < 0.10$. This implies that increasing the number of years of residence in the communities by one unit is likely to increase the likelihood of resource use conflicts (Table 21). The plausible explanation is that the longer a household stays in an area and as the family gets bigger, there is increased pressure on natural resources which in turn lead to resource use conflicts. This further implies that as the ages of respondents' increases, their

demand for natural resources increases including land for settlement and cultivation progressively increases thereby escalating resource use conflicts. These results contradict those of other authors (Mayeta, 2004; Mohamed, 2009) who found that the resource use conflicts decreased with increased duration of residence in the area. It has been reported however, that people who have stayed long (more than 20 years) in the study area tend to develop long term conservation interests (Sumbi, 2004; Mayeta, 2004; Mohamed, 2009). This is due to the fact that a person who has stayed long in a particular area is assumed to have accumulated enough resources particularly land to meet their livelihood needs (Mayeta, 2004; Mohamed, 2009).

4.4.3.4 Level of education

Level education was negatively correlated with resource use conflicts in apiculture and was not statistically significant at $p < 0.05$ (Table 21) This implies that increasing years spent in school by one unit is likely to reduce resource use conflicts in apiculture by a multiplicative factor of 1.166. The plausible explanation is that level of education tends to increase peoples' interests and willingness to take part in conservation activities thereby reducing the chances of resource use conflicts as discussed in section 4.3.2.

The significance of education in explaining awareness of respondents on the importance of natural resource management is well documented (Katani, 1999; Mbwambo, 2000). Katani (1999) in the study carried out in Mwanza district, Tanzania, argued that education tend to create awareness, positive attitudes, values and motivation. Mbwambo (2000) in a study conducted in Udzungwa Mountains, Iringa, Tanzania, reported that people who are more educated tend to develop

interests in planting more trees for their own use as opposed to less educated ones. Planting of trees around homesteads reduce pressure on both protected and common pool resources thereby reducing resource use conflicts among stakeholders. The author argued that education has a direct influence on people's participation in natural resource management and that promotes sustainable utilization of natural resources.

4.4.3.5 Ethnicity

Table 21 shows that ethnicity was negatively correlated with resource use conflicts in apiculture but was not statistically significant ($p > 0.05$). This implies that decreasing number of ethnic groups by one unit in an area is likely to reduce resource use conflicts by a multiplicative factor of 0.543. The plausible explanation is that since there are fewer ethnic groups in the study area, it is likely that the smaller ethnic groups will on a daily basis share a larger group's language to interact (as discussed in section 4.3.7). In this respect ethnicity contributes to reduction of resource use conflicts. Though ethnicity was not statistically significant, the challenge due to the heterogeneous ethnic groups (Table 16) in the study area could present a scenario of communities with heterogeneous interests, mixed norms and rules whereby only short term and mostly cash economic benefits are considered at the expense of conservation of natural resources. This in turn could influence resource use conflicts.

Kajembe *et al*. (2004) argued that every ethnic group has in place social and cultural interests of dealing with resource use conflicts as and when they arise. For example; different ethnic groups have different uses and interests attached to natural resources

such as harvesting of medicinal plants, collecting firewood, cutting of poles for construction of houses and other uses. In some ethnic groups, young people are only allowed by elders to cut mature trees for special purposes while other ethnic groups tend to attach less value on trees and as such abuse of natural resources is high in such instances and may lead to cultural and social dimensions of conflict (Mathias, 2005). Kajembe *et al*. (2003) in their study conducted in Usangu plains, Mbarali District, Tanzania observed resource use conflicts between various ethnic groups. It was further observed that 50% of the respondents argued that relationship between various ethnic groups were bad. They underscored that many conflicts were centred on competition for water. Crop damage by livestock was also behind many conflicts.

4.4.3.6 Household size

Table 10 shows the distribution of households in different agro-ecological zones. The results show that the majority (73.5%) of respondents had household sizes between 5-9 persons per household followed by households of less than 5 (21.4%) persons per household. Table 11 shows that the mean household size of 6 was higher than the national average of 4.7 in 2006. However, Chi-square test indicated no significant difference ($p > 0.05$) in household size between agro-ecological zones (Chi-square value = 10.484, df = 6, $p = 0.104$).

The study also showed that household size was negatively correlated with resource use conflicts in apiculture but was not statistically significant ($p > 0.05$). This implies that increasing the household size by one unit is likely to increase the likelihood of resource use conflicts by a multiplicative factor of 0.754 (Table 21). This is due to the fact that as household size increases, the household demand for goods and

services from the natural resource base is also increased. The increased demand for different goods and services increases the use pressure on the resource base thus creating much tension and conflicts over use of the natural resources (Sumbi, 2004). The author further argued that increased household size demands increased fuel wood, poles for building and land clearing for agriculture to meet the increased food demand at the household level. When all these activities are increased, there are higher chances of increased resource use conflicts in the study area. The results confirm those of Buckles and Rusnak (1999) and Mvena *et al*. (2000) who reported that principally when demand for goods and services from natural resources are increased, conflicts over the use of those resources is increased. When the resources become limited, it is obvious that competition for the resources is also increased.

4.4.3.7 Land size

Table 21 shows that land size positively correlated with resource use conflicts in apiculture but was not statistically significant ($p > 0.05$). This implies that increasing land size by one unit (1ha) is likely to increase the likelihood of resource use conflicts by a multiplicative factor of 1.105. In the studied agro-ecological zones, land sizes are small and some households are landless (Table 10).

The major economic activities (Table 12) in the community included annual cropping, horticultural production and livestock farming. These activities require availability of the land resource implying that any attempt to increase the land size holding of respondents would increase the chance of resource use conflicts with their neighbours. This means that any expansion in land size for cultivation or settlement would exacerbate resource use conflicts in the community.

Conflicts originate from different perceptions of the parties involved regarding who should manage, use and benefit from natural resources. Several factors underlying different conflict situations including geographical proximity and socio-economic factors have been reported (Woodcock, 2002; MNRT, 2003; Farinde *et al*., 2005b; Malugu, 2007).

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The quality and equity of governance determines how natural resources are managed, support the livelihoods of the communities and the sustainable economic development of a country. However, good governance in achieving sustainable natural resource management is largely influenced by a diverse range of stakeholders' interests to share information, build collaboration and pool resources towards a common aim of better livelihood and improved natural resource management. This study was conducted in WUMs with an attempt to elaborate and address diverging stakeholders' interests in apiculture with respect to natural resource management. From the study the following pertinent conclusions are made.

- The study has identified mixed cultivation and settlements as dominant land use type associated with severe degradation of forest resources largely attributed to community's social economic divergent interests. It appears however that apiculture is dominant in this land use type which implies that if intensified, it has the potential of increasing crop production through pollination by bees.

- From the results, it is apparent that the identified stakeholders involved in apiculture have diverse interests including natural resource conservation and livelihood mainly driven by socio- economic interests such as income generation and beehive making.

- The study indicated further that mobilizing small scale farmers into groups would help to manage and mitigate stakeholders diverging interests in apiculture with respect to natural resource management.
- In addition, the study demonstrated that for small scale farmers to engage in natural resource management, economic interest is vital.

- Stakeholders' diverging interests in apiculture were significantly influenced by educational level; household size; marital status and major socio-economic activities (annual cropping, livestock farming, fruit and vegetable production). It is therefore concluded in this study that these factors are likely to increase their influence on stakeholders' divergent interests as the government increases efforts towards education. However, policies that deal with family/household size control may in future reduce the influence of household size on apiculture. On the other hand, socio-economic activities are likely to continue influencing apiculture as long as the country's economy continues to depend on small scale farmers. Increasing the awareness of the stakeholders including women in decision making will likely help to manage the divergent interests.

- The most prevalent resource use conflicts in this study are attributed to stakeholders' different interests for natural and cultural resources largely influenced by decisions on land utilization and conservation of natural resources

- The study demonstrated further that the resources use conflicts is a function of age and gender centred differences mainly on economic benefits at the expense of conservation of natural resources.

- There are conflicts, some them latent because of the perceptions stakeholders have regarding certain institutions. People tend to respect those institutions that have a direct linkage to their livelihoods. For example, the power play between the Lutheran church in Mwangoi and government institutions such as the Land Act of 1999 and the beekeeping act of 2002 which were perceived as remote by the community. The Lutheran church was seen as more relevant to the community in facilitating the use of natural resources over an area it did not have legal authorization. Unless institutions are connected to the livelihoods of the communities they will not be perceived as important.

5.2 Recommendations

The following recommendations are made in the light of gaps revealed from the findings of this study so as to provide further insights on stakeholders diverging interests and emerging resource use conflicts in apiculture and natural resource management.

- The study recommends that efforts should be directed towards promotion of apiculture as an economic incentive for sustainable natural resource management and improved crop production.

- The multiple nature of resource use conflicts identified in the study area calls for a pluralistic approach that recognizes the multiple perspectives of stakeholders and the diverse interests in natural resource management.

- A stepped up and focused approach for mobilization of small scale farmers as beekeepers coupled with establishment of a coordinated framework for natural resource management is strongly recommended. From the study, it is observed that integrated resource management is required. It is therefore recommended that an in-depth study be conducted to develop a framework that will coordinate the management of village level institutions that deal with natural resources use at that level.

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APPENDICES

Appendix 1: Summary of data collection techniques used for different objectives.

Output/objectives	Type of data to be collected.	Source of data/ information	Data collection and analysis method(s)	
		161	Data acquisition	Data analysis
1. To assess farmers land use setting with respect to NRM in the study area	- Different land use types	- Participant observation -Interviews with different stakeholders (h/holds and key informants).	- -Participatory mapping (PGIS) + mental maps. - Arc view GIS 3.2	
2. To identify key stakeholders' and their interests underlying apiculture in WUMs.	-Type of stakeholders -Different interest categories. -Sources of interests and factors influencing them.	-Discussions with different stakeholders (communities, facilitators and regulators) -Information from village and district offices.	- Focused group discussion with stakeholders. - Questionnaire survey of h/holds.	-Content analysis
3. To determine factors that influence stakeholders diverging interests in NRM with respect to apiculture in the study area.	- Socio-economic factors.	-Interviews with different stakeholders (h/holds and key informants).	-Focused group discussion. - Questionnaire survey of h/holds.	- Inferential statistics using Logistic regression model. - Descriptive statistical analysis.
4. To identify the types of conflicts underlying apiculture in the study area.	- Type of conflicts - Nature of conflicts. - Factors influencing occurrence of conflict.	-Interviews with different stakeholders (h/holds and key informants).	- Questionnaire survey of h/holds. -Focused group discussion. -Participant observation.	- Descriptive statistical analysis -Content analysis.
5. To assess socio-economic	- Socio economic factors:	-Discussions with key stakeholders (Communities	-Participant observation. -Focus group	- Descriptive statistics

Appendix 2: Household questionnaire survey form

A) Household Identification.

Village……...Ward……

……

Division…….

Household Identification

No……..

District……

……

Household data

You are requested to provide information on the following questions. All information will be treated confidentially.

1. Name of respondent: ……..

2. Age…… (Years)

3. Sex of respondent: ……

4. Marital status: Married/Single/Divorced/Widowed/Others (specify)……

5. Religion: Christian/Muslim/Pagan/Others…….

6. Tribe: Are you native of this area? Yes/No. Tribe……

7. Residence duration if not native…… (Years).

8. Reasons for moving to the village

(1)…….. ……..

(2)…….

9. Education level: None/Primary/Secondary/College/Others (Specify)……..

10. Social position…….. ……...

Household composition

11. What is the number of members in the household? ……...

12 Adults (18 – 60 yrs)……...

13 Children (below 18yrs)……...

14 How much land do you own (ha)? .....

15 How much land do you cultivate each year (ha)? .....

16 If not all the land, how do you use the uncultivated land?

- 00 Open lands planted with trees and fodder.
-

- 01 Grazing
- 02 Others
- 03 Beekeeping
- (Specify)

……

17. What is your main economic activity? Rank them in order of importance using numbers.

No.	Activity	Rank	Annual Income
1	Annual cropping		
2	Fruit and vegetable production		
3	Livestock keeping		
4	Fishing		
5	Charcoal making		
6	Carpentry		
7	Beekeeping		
8	Others (Specify)		
	Total		

Apicultural activities

18. What is your source of beekeeping information?.....

19. What type of honeybees do you keep? Sting less honeybees. Stinging honeybees.

20. Have you ever heard of an improved beehive? 00 Yes 01 No

21. If yes, are you using any? 00 Yes 01 No.

22. What is your source of improved beehives…….....

23. What is the purchase price of the beehives?

Type of beehive	Price (Tsh)

24. Are you practicing beekeeping as an individual or as a group? (Nature of beekeeper) Individual/group.

25. What type of beehives do you have in your apiary?

S/n	Type of beehive	Total number of beehives	Number of beehives with colonies.	Number of beehives harvested	Honey produced (Litres)	Honey yield (litres/beehive/year) – 2008/09 season.
1	Log hives					
2	Bark hives					
3	Tanzania Top Bar hives					
4	Tanzanian Commercial hives					
5	Others (specify).					

26. What benefits do beekeepers get from beekeeping?

1. Source of food 2 Raw materials 3Medicine

4 Source of income 5 Others, (specify)……

27. What constraints are associated with beekeeping?

Constraints faced by beekeepers	Tick as appropriate	Problem solving technique	Constraint consequences
Theft			
Pests and Predators.			
Weather changes;			
Poor marketing System			
Fodder Availability;			
Water Availability;			
Control Of The Resources;			
Bush Fires			
Jealous			
Competition (Control of the resource)			
Lack of capital			
Lack of extension services			
Lack of storage facilities			
Others (Specify).			

28. Do you have access to credit? 01 Yes 02 No

29. What is your source of credit?.....

30. What are the gender roles performed by the following in beekeeping?

Item	Beekeeping activities performed
Men	
Women	
Youth	

31. If women are not involved, what factors prevent them from engaging themselves in beekeeping? ……

32. How do you process bee products?

a) Honey…….

b) Beeswax…….

33. What materials do you use for honey packaging?.....

34. Where do you site your hives? 1 On farmlands 2 Natural forests

35. What is the current status of hive productivity? 1 Increasing 2 Declining.

36. If declining, what is the reason for decreased productivity? ……..

37. If increasing, what is the reason for increased productivity?.....

38. Is the marketing situation of the honeybee products available? 00Yes 01 No.

39. Who determines the honey price?.....

40. What is the farm gate price of bee products?

a) Honey ……. (Tsh/litre)

b) Beeswax …….. (Tsh/kg)

B. To identify key stakeholders' diverging interests underlying apiculture in WUMs.

C. To determine the phenomena that explains the spatial distribution of stakeholders diverging interests and perceptions in the study area.

1. Who are the key stakeholders in beekeeping? (Individuals, groups and institutions)

No	Key stakeholders	Individuals	Groups	NGOs	FBOs	Farmers	Others(Specify)
1							
2							
3							
4							
5							
6							
7							

2. Why are these stakeholders interested in beekeeping? Eg Cash, honey; others (specify);…….

3. Are you aware of the role of beekeeping in Natural Resource Management?

……

	Key stakeholders	Role/s played							
No		BKD	PM	BC	FM	MI	VA	CB	Other (Specify)
1									
2									
3									
4									
5									
6									
7									

4. What are the roles played by the various stakeholders identified above?

KEY:

BKD = Beekeeping development: PM = Producer mobilisation:

FM = Fire management: MI = Marketing issues: CB = Capacity building: VA = Value addition: BC = Biodiversity conservation.

5. In your opinion which stakeholders are more active in promoting beekeeping in your area?……

6. What is your honey market chain? E.g. Farmer – village; Farmer – village – ward etc.

7. What are peoples' perceptions or views on the informal governance structures in apiculture in your area? (Culturally, Norms, Values, Customs).

Culturally
……
Norms
……
.
Values
……
.
Customs……
Others (Specify)
……..……

8. What is the level of perception on the importance of beekeeping in your area? Low/Moderate/High.

9. What are the factors influencing stakeholders' diverging interests and perceptions in apiculture in your area?

Biophysical factors (Land availability)	Socio-economic factors

D. To identify the type of conflict underlying beekeeping in the study area.

1. What is/are the sources of conflict experienced in beekeeping?

Conflict	**Tick as appropriate**
Conflict between beekeepers and fellow farmers	
Conflict between individuals and beekeeping groups	
Conflict among family members	
Conflict between small farmers and middle men	
Conflict between individuals and groups	
Conflict between extension officers and beekeepers (e.g. not enough extension services provided).	
Others (Specify)	

2. What is the nature of the conflicts?

Violent clashes/Animosity/Disagreements/Arguments/Tensions/Chasing away/

Others (specify)……..……

3. What time of the year are conflicts most prevalent? Why?

……

4. Mention the types of institutions used for conflict resolution in NRM

Formal/Informal/Both

5. Which do you think is best in resolving resource use conflicts between formal and informal institution? None/Formal institution/Informal institution/Both.

6. Please give reason/s for the effectiveness of the institutions for conflict resolution.

……

7. Perception on the effectiveness of the institutions used for conflict resolution

High/Moderate/Low

8. What are your views on the future improvement of beekeeping for NRM?

……

……

E. **To assess socio-economic factors underlying resource use conflicts with regard to apiculture.**

Appendix 3: Checklist for Key Informants/Focused group discussion.

Key informants

A. Village leaders/Village elite groups/Villagers

B. Representatives of NGOs and CBOs working in WUMs.

C. District Forest Officer/Beekeeping Officer/Natural Resources Officer/Researchers and Extension staff.

Issues to be discussed and collected

1. General information
   a. Date……Place of interview…….
   b. Name …….Sex……
   c. Position……

1. Who are the key stakeholders involved in apiculture?
2. What are the stakeholders' perceptions of apiculture?
3. How are they involved with apiculture?
4. How are stakeholders organized to use, manage and/or control the forest use with respect to sustainable apiculture?
5. Are there any stakeholders who are excluded from apiculture?
6. How does bee keeping compare with crops in terms of income?
7. How does beekeeping compare with livestock in terms of income?
8. Are there any conflicts that you have seen or heard about in this area with regard to apiculture? YES/NO.
9. What are the commonly reported conflicts in apiculture?
10. What are the impacts of forest or farmland use conflicts on apiculture?
11. What socio – economic factors enable or constrain the performance of apiculture?
12. What are the main enterprises found in WUMs? (Crop and livestock production; aqua and apiculture; forestry; service, credit and input supply; processing, wholesaling, retailing; non-agricultural industries and services). Rank them in order of importance.

Appendix 4: Index for determinants of stakeholders' Interests

	Index for determinants of stakeholders' Interests						
Household	Participation in apiculture group activities	Market accessibility	Awareness of role of apiculture in NRM	Type of beehives	Level of perception	Level of information flow	Yj
1	5	4	5	5	5	4	4.67
2	5	4	4	5	5	4	4.50
3	5	4	4	5	5	4	4.50
4	5	4	4	5	5	4	4.50
5	5	4	4	5	5	4	4.50
6	5	4	4	5	5	4	4.50
7	5	4	4	5	5	4	4.50
8	5	4	2	5	5	4	4.17
9	5	4	4	5	5	4	4.50
10	5	4	3	5	5	4	4.33
11	5	4	3	5	5	4	4.33
12	5	4	4	5	5	4	4.50
13	5	4	4	5	5	4	4.50
14	5	4	4	5	5	4	4.50
15	3	5	5	5	5	4	4.50
16	3	5	5	5	5	3	4.33
17	3	5	5	5	5	3	4.33
18	3	5	4	5	5	3	4.17
19	3	5	4	5	5	4	4.33
20	3	1	1	5	5	3	3.00
21	3	5	4	5	5	4	4.33
22	3	5	1	5	5	3	3.67
23	3	5	4	5	5	3	4.17
24	3	5	1	5	5	3	3.67
25	5	5	4	5	5	4	4.67
26	5	5	4	5	5	4	4.67
27	5	5	5	5	5	4	4.83
28	5	5	5	5	5	4	4.83
29	5	5	2	5	5	4	4.33
30	5	5	1	5	5	4	4.17
31	5	5	4	5	5	4	4.67
32	5	2	5	5	5	4	4.33
33	5	5	1	5	5	4	4.17
34	5	5	4	5	5	4	4.67
35	5	5	1	5	5	2	3.83
36	4	2	5	2	5	2	3.33
37	4	4	3	2	5	2	3.33
38	4	4	3	2	5	2	3.33
39	4	2	4	2	5	2	3.17
40	4	2	4	2	5	2	3.17
41	4	4	4	3	5	2	3.67
42	3	4	4	3	5	2	3.50
43	3	4	3	2	5	2	3.17

Appendix 4: Continued

44	3	2	4	5	5	2	3.50
45	3	4	4	3	5	2	3.50
46	3	4	3	5	5	2	3.67
47	3	4	4	3	5	2	3.50
48	3	4	4	3	5	2	3.50
49	3	2	4	5	5	2	3.50
50	3	3	4	5	5	2	3.67
51	3	3	4	2	5	2	3.17
52	3	3	4	5	5	2	3.67
53	3	3	4	5	5	2	3.67
54	3	3	4	2	5	2	3.17
55	1	1	4	1	5	2	2.33
56	1	1	3	1	5	2	2.17
57	1	1	3	1	5	2	2.17
58	1	1	1	1	5	2	1.83
59	1	1	1	1	5	2	1.83
60	1	1	3	1	5	2	2.17
61	1	1	1	1	5	2	1.83
62	1	1	1	1	5	2	1.83
63	1	1	3	1	3	2	1.83
64	1	1	4	1	5	2	2.33
65	1	1	3	1	3	2	1.83
66	1	3	1	1	3	2	1.83
67	1	3	3	1	5	2	2.50
68	1	3	1	1	5	2	2.17
69	1	3	3	1	5	2	2.50
70	1	4	1	1	5	2	2.33
71	1	4	1	1	5	2	2.33
72	1	4	1	1	5	2	2.33
73	1	4	3	1	5	2	2.67
74	1	4	3	1	5	2	2.67
75	1	1	1	1	5	2	1.83
76	1	2	3	1	5	2	2.33
77	1	2	1	1	5	2	2.00
78	1	1	1	1	5	2	1.83
79	1	1	1	1	5	2	1.83
80	1	2	3	1	5	2	2.33
81	1	1	1	1	5	2	1.83
82	1	2	1	1	5	2	2.00
83	1	4	3	1	5	2	2.67
84	1	4	1	1	5	2	2.33
85	1	4	3	1	5	2	2.67
86	1	3	1	1	5	2	2.17
87	1	4	3	1	5	2	2.67
88	1	2	1	1	5	2	2.00
89	1	1	3	1	5	2	2.17
90	1	2	3	1	3	2	2.00
91	1	2	1	1	5	2	2.00
92	1	4	1	1	3	2	2.00

Appendix 4: Continued							
93	1	3	3	1	3	2	2.17
94	1	3	1	1	3	2	1.83
95	1	3	3	1	5	2	2.50
96	1	2	1	1	5	2	2.00
97	1	4	1	1	3	2	2.00
98	1	4	1	1	3	2	2.00

Key for Participation in apiculture group activities; Market accessibility; Level of perception of importance of apiculture and Level of information flow.

Very poor	Poor	Fair	Good	Very Good
1	2	3	4	5

Key for type of beehives.

Not practicing apiculture	Traditional beehives	Traditional /Modern beehives	Modern beehives - Lang troth	Modern beehives – Top bar
1	2	3	4	5

Key for awareness of role of apiculture in NRM

None	One parameter	Two parameters	Three parameters	Four parameters
1	2	3	4	5

Parameters

Biodiversity conservation
Fire management
Environmental services
Aestetic value