ASSESSMENT OF LAND USE CONFLICTS AND THEIR MANAGEMENT IN MOUNT MERU AREA, ARUSHA TANZANIA

BY

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ABSTRACT

The study was conducted to assess land use conflicts and their management in Mount Meru area of Arumeru District, Arusha Tanzania. The main objective was to study the nature and types of land use conflicts in order to discern the underlying causes and come up with appropriate management approaches to mitigate these conflicts. Primary data were obtained through PRA, discussion with key informants, questionnaire survey and field observations. Secondary data were obtained from the available archive. Multiple linear regression model was used as a tool for analysis. About 91.9% and 92.7% of respondents indicated that land is not enough for crop production and livestock grazing respectively. Moreover, 32.0% of respondents indicated that conflicts emanate from grazing illegally in the forest. Among the factors involved in regression model, big number of livestock had positive influence on illegally grazed livestock ($p = 0.01$). About 18.0% of respondents indicated conflicts emanating from farm boundaries, and 16.0% indicated conflict resulting on encroachment into forest and wildlife reserves. 14.0% indicted conflicts emanating from illegal tree cutting from forest reserves for household use and selling, while 11.0% and 9.0% indicated other sources of conflicts e.g. Poaching and illegal fuelwood collection respectively.

Finally the study recommended that big herds, which are fed under free-range could be sold and replaced with few stall-fed improved cattle breed. Further, optimization of homegardens productivity can be achieved by planting as many crops in limited space available and use of improved good quality seeds and fertilizers. It is also recommended that formal education and promotion of environmental education be used to create resource conservation awareness. Where appropriate government should redistribute

abandoned big farms to landless people and finance part of the establishment costs for people migrating to spacious districts. Further, Management Plans should address the concept of Joint Resource Management

DECLARATION

I, Constantine John Shio do hereby declare to the Senate of Sokoine University of Agriculture that the dissertation presented here is my own original work and that it has not been submitted to any other University for a degree award.

Signature.....

Date.....25th May 2004

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DEDICATION

"Keep hold of instructions, do not let go; guard her, for she is your life". Prov. 4:13

This dissertation is affectionately dedicated to my parents, the late father John Paul Olukaria Shio, and Maria Jacob who sacrificed their meagre savings to keep me in school.

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I thank God for his love, faithfulness and care, which enabled me to pursue this work, for all knowledge and understanding come from him. Glory be to his Name forever and ever more.

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LIST OF ABBREVIATIONS

ACTS	African Centre for Technology Studies
CBC	Community Based Conservation
FAO	Food and Agriculture Organization
GN	Government Note
IIED	International Institute for Environment and Development
IRD	International Research for Development
JFM	Joint Forest Management
km.	Kilometre
LU	Livestock Unit
MALD	Ministry of Agriculture and Livestock Development
MLNRT	Ministry of Natural Resources and Tourism
NORAD	Norwegian Agency for Development
NGOs	Non-Governmental Organizations
PRA	Participatory Rural Appraisal
SCAPA	Soil Conservation and Agroforestry Programme Arusha
SIDA	Swedish International Development Agency
SPSS	Statistical Package for Social Sciences
TBS	Tanzania Bureau of Statistics
TAS	Tanzania Shillings
UNCED	United Nations Conference on Environment and Development
URT	United Republic of Tanzania

VEC	Village Environment Committee
VEO	Village Executive Officer
CAWM	College of African Wildlife Management

CHAPTER ONE

1. 0 INTRODUCTION

1.1. Background information

Land is the most important natural resource endowed to human kind, primarily because of its ability to support life. It represents the gift of nature to our productive processes. Land also hosts many other non-living natural resources e.g. minerals. Land is also considered to be one of the four factors of production; others being labour, capital and entrepreneurship (Samuelson, *et al.*, 1992). One of the most important elements of any government policy lies in the efficiency to optimise land value (Kajembe *et al.*, 1999). However, land like any other resource is always scarce, and many sections of the society are competing for it. Competition among individuals and among land uses has its impact on land resource supplies (Barlowe 1986). Serious supply problems do not develop as long as each type of use can expand without impinging on the areas needed for other purposes. But complication arises when conflicting uses compete for the same areas. Barlowe (1986) further stated that our overall demand for land resources finds its roots in the need and aspirations of the many individuals who make up a society. People have different wants and desires. Up to a point, everyone is concerned with the physical need to secure sufficient food and other materials to sustain life. Beyond that people want of land is influenced by their knowledge of how land resources can be used, their cultural and education background, incomes and their spending power, individual tastes and personal goals. The single most important factor that affects land demand is population pressure. Regardless of the position one takes on the controversial question of population control, it must be recognised that increasing population pressure has important impacts on the demand for land and its products. Williams (1998) points out that from 1969 to1990, the Sahel area for

example has experienced a rapid population growth of about 3% per annum. The combination of increasing aridity, drought and population pressure has resulted in substantial shifts in land use and put stress on common pool resource.

1.1.1 Land use in Tanzania

Tanzania is a vast country with the total area of about 95.5 million hectares, with the land surface of about 88.6 million hectares (FAO, 1992), and 5.9 million hectares covered by water. Out of this area, 33.5 million hectares are forests and woodlands. About 13.0 million hectares of this forested area have been gazetted as forest reserves. Over 80,000 hectares of the gazetted area is under plantation forestry and about 1.6 million hectares are under water catchment forests (URT, 1998). The forest offer habitat for wildlife, beekeeping, unique natural ecosystems and genetic resources. They are also an important economic base for the country's development. The remaining two-thirds of this forested land consists of woodlands on public lands, which lack proper management (URT, 1998). Public lands are communal and available for use; they are regarded as common property, whereas in the reserves, utilization is restricted by issuing of licenses (Luoga, 2000). URT (1998), point that public lands are under enormous pressure from expansion of agricultural activities, livestock grazing, fires and other human activities.

In Tanzania, all land legally belongs to the state, and individuals are granted rights of occupancy only. Of the total land area, 26% is in the public estate, with no leases granted, of which 16% is fully protected as National Park or similar control (Huggins, 1999). Individual leases vary in length from short term (1-5 years), medium term (5-33 years) to a maximum of 99 years and a fee is payable annually. Huggins (1999), continue to point out that issuing of short term leases encourages the leaseholder to maximize profit from land

use in a short period, and can thus lead to a lack of investment in these plots and even to land degradation. Under the present land laws, there are no restrictions on access to land. Any person, citizen or foreigner can apply and be allocated land for any type of use. This has facilitated acquisition of land for speculative purposes, especially in prime agricultural, industrial, commercial and residential areas.

Over 90% of the basic necessities of rural communities in Tanzania are derived from land (Kidegesho, 2001). At the same time human and livestock populations are growing at an alarming rate. Human population growth for Arusha is at a rate of 4 % per annum. National rate for the years 1988-2002 was 2.9% (URT, 2003). The livestock population growth rate between 1980 – 1994 was 3.2% per annum (MALD, 1991). Increased human and livestock population has led to increasing need of land for agriculture, pastoralism and settlements. It generally suffices to say that overpopulation has created land scarcity and consequently has led to land use conflicts and degradation of resources particularly in fertile mountainous areas.

1.1.2 Land use around Mount Meru

The Mount Meru area in Arumeru district is one of the districts of Arusha region. The district has an area of about 296,600 hectares of which 48,375 hectares are forest and wildlife reserves comprising of Mount Meru Catchment Forests, Mount Meru Forest Plantations and Arusha National Park (URT, 1998). For many years the natural forests and plantations have been providing timber for building, wood fuel and pasture for domesticated animals (URT, 1998; Mkeya, 1994). The area is inhabited mainly by the Waarusha and Wameru. The Waarusha are agropastoralists and the Wameru peasant farmers. According to 2002 population and housing census, Arusha region had a population

density of 38 people per km^2. When the districts are considered separately the entire outlook of population density changes and vividly reveals the serious situation experienced by Arumeru district with the population density of 174 people per km^2. Arumeru district takes the lead in the region in both population size and density (URT, 2003). The high population size and density are a cause of social crisis in the district.

1.1.2.1 Subsistence farming around Mount Meru

The Wameru who inhabit southeastern slopes of Mount Meru practice subsistence agriculture with large emphasis on crop production. The crop production by small-scale farmers is based on subsistence home gardens. It is the whole crop-tree-animal units being intensively managed by the family labour. Livestock production has become part of the social system and it is done mainly through improved breeds especially dairy cows, which are stall-fed. On the other hand Waarusha people practice agropastoral system, which is defined according to the mode of association between livestock and cultivation. Gulliver (1957) pointed out that generally, Waarusha are a subgroup of the Maasai who have adopted a settled pattern of living. Crop production is on small scale, while keeping herds of livestock in a free-range system.

1.1.2.2 Creation of Forest Reserve around Mount Meru area

Organized forestry activity started around 1897 when some of natural forests in the mountains were demarcated by the German colonialists and reserved to protect water catchment areas, prevent soil erosion and commercially exploit valuable timber (Kajembe and Malimbwi, 1996).

Mount Meru Forest Reserve was established during this time of the German era and it was legally recognized in the 1920s by Government Note (GN) 232, which was amended by GN 84 of 1967. Formerly the forest was set-aside as a potential area for timber production. In order to cater for increased timber utilization, there was an establishment of 8,000 ha. of softwood, fast growing timber species in the early 1950's. As a result the natural forest was reduced from 48,375 to 40,375 hectares. Further in 1967 the area of about 13,941 hectares was delincated for wildlife conservation, hence the now Arusha National Park. The establishment of the Mount Meru Forest and Wildlife Reserves displaced people who formally settled around these areas, to lower plains. Figure 1 presents Mount Meru Forest/Wildlife reserves.

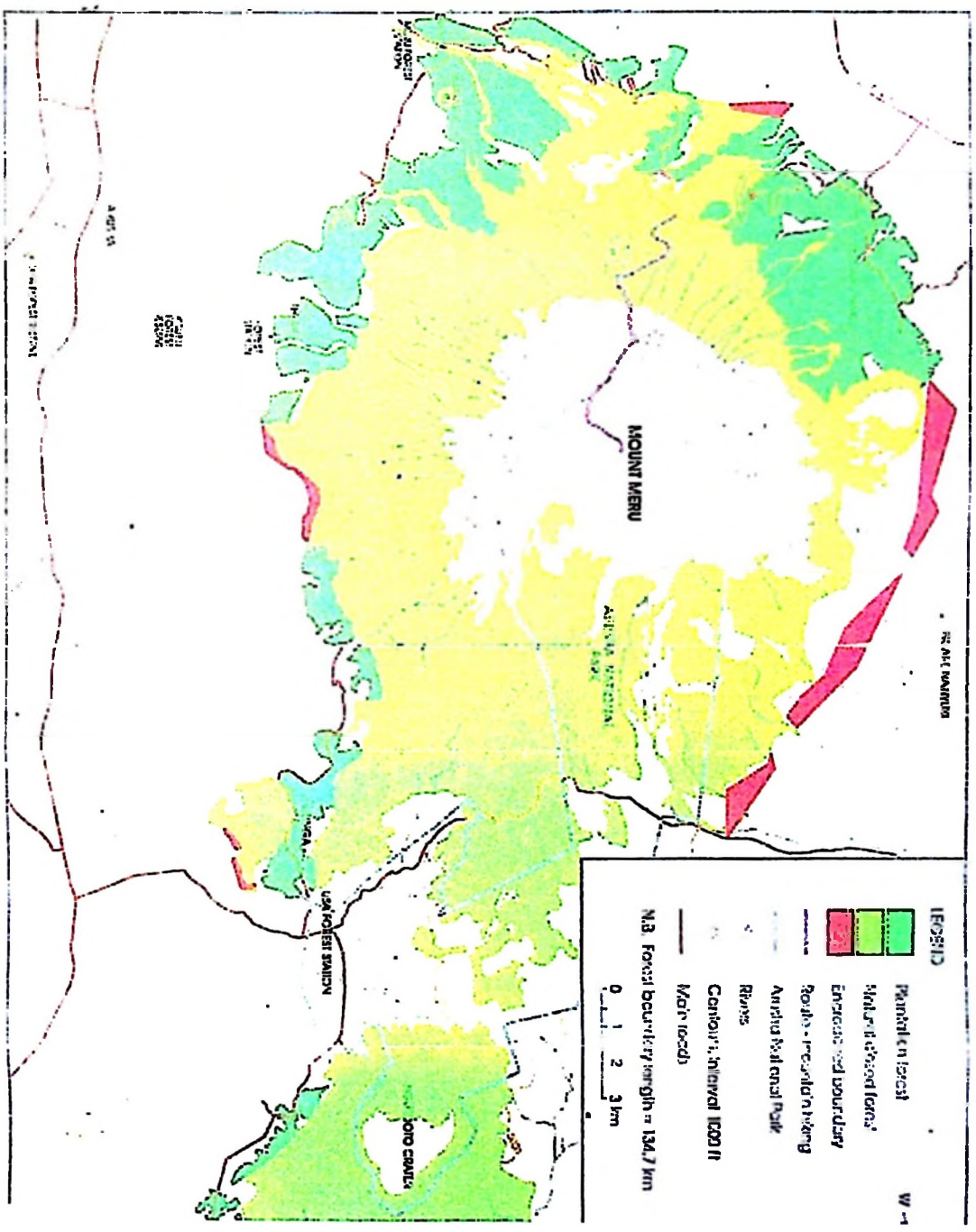

Figure 1: Mount Meru forest/wildlife reserves

1.1.2.3 Management of reserves in connection to the communities around Mount Meru

The style of management of these reserves has its origins during colonial era. Even after independence the government has continued to expand the protected area. The legislation and tenure systems introduced during colonial period have been maintained despite the negative impacts such as land scarcity facing neighbouring communities. With substantial rural population pressure like the area around Mount Meru, state ownership of the reserves is important in order to avoid such situation like resource degradation due to mismanagement and overexploitation if the resource is left as common property. Under common property there are no formal or informal institutions restricting the use of a resource, hence it is optimal to each user, to utilize the resource values as long as there is private profit of using one more unit of resource (Skage and Naess, 1994). In consequence, common users tend to derive for themselves as much profit from the resource as they can and eventually, deplete the resource. Hence it has been necessary for the state to own the reserves so as to direct development and protect them from destruction by local people. The reserves have common boundary with many villages, which face land scarcity for grazing and cultivation. Local residents in these villages believe that the whole area of Mount Meru forest reserves (48,375 ha) gazetted in 1920 is their tribal land, of which they were not compensated in any way for loss of the area they traditionally occupied.

Further, setting up the reserves implies limitation to the very needed forest resources such as fuelwood, timber for construction, animals and many other non-timber forest products. Consequently with large human and animal populations bordering the protected area, considerable number of conflicts between the management of the reserves and the local people has emerged regarding access and use of resources.

1.2 Conflicts in natural resource management

Natural resource conflicts are disagreements and disputes over access to, and control and use of, natural resources (FAO, 2000). These conflicts often emerge because people have different uses for resources or want to manage them in different ways. FAO (2000) noted that disagreements also arise when these interests and needs are incompatible, or when the priorities of some user groups are not considered in policies, programmes and projects. Such conflicts of interest are an inevitable feature of all societies.

Conflict over natural resources can take place at a variety of levels, from within the household to local, regional, societal and global scales. Furthermore, conflicts may cut across these levels through multiple points of contact. Conflicts occurring mainly in local contexts may extend to national and global levels because of their special legal relevance (Weitzner and Borras, 1999), or as a result of efforts by local actors to influence broader decision-making process. In many regions of Africa, natural resource management decisions are increasingly influenced by the resource users, who include small – scale farmers and indigenous peoples as well as ranchers, large scale land owners and private corporations in industries such as forestry, mining, hydropower and agribusiness (FAO, 2000). Power differences between groups can be enormous and the stakes a matter of survival. In recent years, the world community has realized that environmental destruction such as land degradation on agricultural, pastoral lands and protected areas are related to farmers interaction in forest ecosystems, inappropriate use and mis-management of resources, and population pressure (Mkeya, 1994).

1.3 Problem statement

The Tanzanian government owns most of the land around Arumeru district, and indeed all other lands in the country. In Arumeru district it owns the major part of the land in the form of gazetted forests (Arusha catchments forests and Mount Meru forest plantations), and wildlife reserves- (Arusha National Park). According to Monela (1989), the remaining part of the land is owned by families in the form of farm holdings, cattle enclosures and/or residential areas. Renting of land sometimes is practised between families but effective cultivation does not warrant a condition of tenure.

The major land uses in Arumeru district include agriculture, pastoralism, forestry, wildlife, and human settlements. People around Mount Meru have very small plots of land of about 0.5 hectares where they grow crops such as coffee, banana, maize, potatoes and vegetables. The same plots are also used to hold about 18 heads of cattle (Monela, 1989). Generally, the land holdings in Mount Meru area are too small to sustain the production of food and other goods for the household for the whole year. Local people need various forest products such as firewood, poles, fodder, mushrooms and medicine. With the rapid growing population, the rural poor tend to maximize the use of forests to the detriment of the ecosystems. The conflict in resource use is more serious because the reserves are bordering densely populated areas. For instance both people and animal populations depend on forest reserves for many needs, such as to exploit the forests for fuelwood, construction timber, grazing and many other products and services. Since the local people lack access to the reserves and have no alternative sources to meet the necessities, the forests become vulnerable to illegal encroachment by cultivators, grazers and exploiters for variety of products.

Basically the conservation interests are towards preservation and sustainable use of reserve ecosystems but the community interests are to have access to the reserves for grazing livestock, obtain wood for various uses and land for cultivation of crops. This is the basis of resource conflict in the reserves around Mount Meru.

It is necessary to state here that due to increased human and livestock populations there has been imbalance between demand and supply of land for pasture and cultivation and increased demand of products and services from the reserves. Consequently we can discern three types of conflicts, namely, limited access (the right to enter reserves), limited withdrawal (the right to obtain products from reserves) and contested boundaries amongst farmers and between villagers and reserves managers. It is important therefore to carry out a detailed study on land use conflicts in Mount Meru area so as to establish the underlying causes and devise best conflict management approaches.

1.4 Objectives of the study

1.4.1 Overall objective

The overall objective is to study the nature and type of land use conflicts in the Mount Meru area in order to discern the underlying causes and to come up with appropriate management approaches to mitigate these conflicts while instituting wise use of land and other natural resources.

1.4.2 Specific objectives

1.To evaluate socio-economic factors affecting land use, in the study area.

2.To examine nature and types of existing land use practices.

3.To identify land use conflicts, their nature and causes in the study area.

4.To identify current and future measures for resource use conflict management.

1.5 Research hypotheses

In order to assess land use conflicts and their management; the following hypotheses were tested:

H_o: Conflicts between agropastoralists/farmers and forest/ wildlife reserves are not due to pressure on land.

H_1: Conflicts between agropastoralists/ farmers and forest/ wildlife reserves are due to pressure on land.

CHAPTER TWO

2.O LITERATURE REVIEW

2.1. Conflict theory

Conflict theorists as pointed out in Mvena *et al.*, (2000), assume that societies are in a constant state of change, in which conflict is a permanent feature. Conflict in this sense does not necessarily imply outright violence; it includes tension, hostility, competition and disagreement over goals and values. For both Karl Marx and Georg Simmel viewed conflict as a pervasive and inevitable feature of social systems. Mvena *et al.*, (2000), continue to argue that conflict is often thought of as the opposite of cooperation and peace, and is mostly commonly associated with violence or the threat of violence. In many settings, they continue, conflict should be seen as a potential force for positive social change; its presence being a visible demonstration of society adapting to a new political, economic or physical environment.

2.2 A typology of conflicts

The word 'conflict' is loaded with connotations, and needs definition to be used accurately (Huggins, 1999). It is important to note that there are different levels of conflict. A situation where two parties have conflicting resource-use strategies, which means that a success of one will be detriment to the other, is a 'latent' conflict, whether or not the two parties are aware of the potential for conflict. A 'manifest' conflict is one where competing strategies have resulted in the parties articulating their dispute. The most serious level is a violent conflict (*ibid*). Huggins, (1999) continue to point out that a more systematic way of categorizing conflicts is to divide them into activity related disputes and actor-related disputes. For instance, a case study of Malian land use conflicts when classified

according to activity includes predominantly agriculture disputes, predominantly pastoralists disputes and dispute over fishing rights. The agricultural disputes usually relate to issues of boundary demarcations, ownership, land loans, and inheritance.

When the same case study is classified according to actors, it can be seen that there are those between individuals (which can be over any land use: agriculture, pastoralism, or fishing), those between village communities, between individuals and communities, and disputes between decentralized institutions. This latter type exacerbates conflict of all types, as individuals and communities are represented or challenged by institutions.

2.3 Conflict as a concept

While conflict has been part and parcel of human societies for centuries. The concept is used very widely with considerable confusion (ACTS, 2000). We now talk of political conflicts, armed conflicts, environmental conflicts, etc. Sometimes conflicts are equated to their causes and other times to their manifestation. This often generates considerable policy and political implications. With regard to causes, conflict is perceived as an artifact of human need denied (Burton, 1990), resource competition (Hirsch *et al.*,1999), lack of equity, justice and fairness (Kant and Cooke, 1996) and governments' centralized "fences-and-fines" approach to conservation policy of expropriation of lands and the forced relocation of communities (Weitzner and Borras, 1999).

ACTS (2000), point further that in order for resource scarcity to be a source of conflict, it doesn't have to be in absolute numbers. Frequently, localized scarcity is a product of an equal access to resources, which is determined by legal rights, technological and economic means to exploit natural resources and other factors. Ecological vulnerability (sometimes associated with climatic change and drought) and subsequent environmental stress can also

cause natural resource scarcity. However, it is important to note that environmental scarcity operates with other political, economic and cultural factors to cause conflict.

2.4 Land use conflicts and underlying causes

Conflict over resources such as land, water and forests is ubiquitous (Anderson *et al.*, 1996, Ayling and Kelly, 1997). People everywhere have competed for natural resources they need or want to ensure or enhance their livelihoods. However, the dimensions, level and intensity of conflict vary greatly. Conflicts over natural resources may have class dimensions; pitting those who own the resource against those who own nothing but whose work make the resource productive. Political dimensions may dominate where the state has a keen interest in a public good such as conservation (*ibid*) or in maintaining the political alliances it needs to remain in power.

According to report by ACTS (2000), it was observed that in addition to the broader sources of conflict in Africa a number of other factors are especially important in particular situations and sub-regions of Sub-Saharan Africa. In Central Africa for instant they include the competition for scarce land and water resources in densely populated areas. In Rwanda for example, multiple waves of displacement have resulted in situations where several families often claim rights to the same piece of land. The Rwanda conflict provides perhaps the best direct example of an ecological conflict that has manifested itself in grave political confrontation between two ethnic groups, the Hutus who are predominantly agriculturalists and the Tutsis who are predominantly pastoralists. The conflict can be explained partly by the scarcity of land resources. The country faces a highly population density, estimated at 386.7 persons per square km in 1986. Historically, pastoralist Tutsis demand large tracts of land for their herds of cattle, while the Hutus require arable land for extensive agricultural

production. There is as a result, competition for access to and control of land by the two tribes. Over the years, the conflict has been manifested in political confrontation - a struggle to retain political power and hence control access to land.

Morindat et al. (2003) reported that in Tanzania, conflict between the agriculturalists and pastoral Maasai in Kilosa district expresses the magnitude of land use conflicts if not well managed. The conflict in Kilosa District resulted in death of more than 40 people and damage to cattle, houses and crops. It was established that a major problem relates to the privatisation of pastoral commons through the establishment of ranches and farms. A case in point was the ongoing efforts relating to Mkata ranch, which deny pastoralists access to major pasturing grounds, especially during the dry season.

ACTS (2000), further reported that in the southern Sudan the conflict has been framed around religious issues and differences. Its roots lie in competition for access to and control of key natural resources, particularly minerals. Southern Sudan is reach in minerals especially oil. In 1981, huge quantities of commercial oil deposits estimated at 2000 million barrels enough to earn the Sudan some US $ 10,000 million or cover its estimated energy needs for about ten years were discovered. Southern Sudan is also more adequately supplied with water compared to Northern Sudan hence expansion of agriculture into the areas that were traditionally occupied by the Nilotic nomadic tribes is a potential threat to the cattle economies predominant in these areas and a breeding ground for possible confrontation hence conflict.

2.4.1 An overview of conflicts on land ownership among the Wameru people

According to Kirilo and Scaton (1967), conflict over land use and ownership around Mount Meru area became evident long time ago around 1880's. He contends that before Europeans came to Tanganyika, the Wameru lived on the slopes of Mount Meru. Engarenanyuki, which was part of Meru country, was believed to be a place that God gave them so that they could get salt. The Wameru had many struggles in the area of Engarenanyuki against the Maasai who tried to take the country away from the Wameru and thus obtain salt. The greatest struggle took place in 1880 and after that there was no more struggles between Wameru and Maasai because the Maasai were defeated and they were prevented from using the salt.

During the arrival of Germans in 1895, the Wameru struggled against them for five years during which two missionaries were killed. At various times during their rule, Germans took land from Meru and gave it to the German settlers and Afrikaans. When Germans lost war in 1919, the British came in. Some of German settlers vacated the land, and during the period 1925-1939 the Wameru people were allowed to purchase those farms. Prior to the outbreak of World War Two there was a proposal by settlers to link up Engarenanyuki and Engarenairobi area to a homogenous cattle grazing area developed on modern lines with governmental supervision of disease prevention measures. The move failed and in 1946 a Commissioner was appointed to study the issue and give recommendations of redistribution of such lands. The Commissioner received various opinions from groups of settlers and other individuals but not from Wameru people. The Commissioner made his report-endorsing the proposal to link the two parts. The report also proposed that as compensation, the Wameru displaced from Engarenanyuki areas should be allowed to settle in a largely unoccupied area known as King'ori, further South of Mount Meru. Also Usa area be

returned to Meru tribal use. The Wameru at once objected vigorously to the proposed scheme, pointing out that the land offered as compensation were inferior, infested by tsetse flies and very poorly watered. The government official on a public meeting informed the Meru people that the government had decided that the Wameru should move from Engarenanyuki, whether they liked or not and the government would assist them with transport and building new houses for them in the new areas. This move created a very big conflict of which, as a result, six people were arrested, people's properties vandalized and houses burnt down. Consequently the Meru people were evicted by force, and displaced with no clear settlements and both their livestock and properties lost. Of recent the King'ori area is scantly populated with much of the people undertaking crop raising in the rainy season, while going back to reside in congested mountain side. Part of Engarenairobi and Engarenanyuki areas has remained under state farms and ranches.

2.4.2 Gazettement of communal lands

Matose (1997) reported that conflicts in Mafungabusi Zimbabwe were generally over the state's gazetting of an originally communal land into a forest reserve.

When the Forestry Commission gazetted 82,000 hectares of land as forest reserve in a communal land, it automatically and initially rendered that piece of land and its resources out of bound to communities living within and outside the forest reserve. The new boundary separating forest edge communities and the forest reserve put resources beyond the reach of local communities. Local communities were against this development because they perceived the forest reserve area as their original homeland. As a result, in spite of the government gazettement, they continue to appropriate resources illegally from the forest reserve.

According to Sida (1999), access to land and other natural resources such as water is one of the hottest issues today in Tanzania. Besides land degradation and fragmentation, large private estates have alienated better land tracts, pushing small holders into less desirable areas. Increasing conflict is reported between farmers in different economic strata, between pastoralists and agriculturalists and pastoralists and the state and between the generations.

The main current land use conflict at a macro-scale is situated between crop production and pastoral livestock systems (De Pauw, 1995). Lane and Moorehead (1994), documented a land use conflict in Tanzania resulting from alienation by the government of more than 40,000 hectares of prime grazing land from the Barbaig pastoralists in Hanang district to develop large-scale parastatal wheat farms. In the process, the Barbaig grazing systems collapsed and severe environmental degradation resulted. Similarly, large tracts of land in the central Maasai land was taken over by settlers and converted into beef ranches, wheat schemes and smallholder farms. Land use conflicts arise also at the interface between urban and rural areas (De Pauw, 1995). This is at present mainly the case in some highly settled areas, such as Kilimanjaro and Arusha, where the legitimate need for expansion are hampered by very high population density and land shortage in the surrounding rural areas. Many land uses are not compatible with others, and operators frequently have different combinations of interests and objectives that cause them to assign different weights to the private and social benefits associated with alternative land uses. Conflicts of interest are a frequent result (Barlowe, 1986).

2.4.3 Creation of forest and wildlife reserves

Ouedragaogo (1991) argues that one of the most important conflicts related to forest management is the conflict between the forest administration and local communities.

Burkina Faso for example, has created many forest reserves and protected wildlife areas, most of which were created during colonial period. By creating the reserves, the colonial administration hoped to protect the forests. Another objective was to create reserves of wood for needs of the colonial economy.

Schmitthusen, (1986) observed that the end of the colonial period and the democratization process opened doors for challenging the colonial forest reserve policy. At the end of colonial period, local communities started to contest the colonial forest reserve policy. They claimed that the areas within reserved forests were the lands of their ancestors, and that the state could not claim property in those areas any longer. Local communities perceived the forest reserves as an expropriation of their lands for agriculture and pastoral activities. This protest emerged to change the status of forest reserves so that agricultural or pastoral activities could be pursued.

2.4.4 Population pressure and use of forest resources

It has been observed by FAO (1989) that the major area of forest resource use conflict is the interaction between farmer communities and the forest reserves. The traditional idea of establishing forest reserves was to prevent or minimize the interactions so that the forests are preserved. In general, the focus of protection was to shield the forest from increasing use driven by demographic pressure. However as population pressure around the forest reserves increases, there is increasing demand for food. This has resulted in clearing the forests to provide land for crop production and grazing of animals.

2.4.5 Local community institutions for resource management

Ostrom (1992) defines institutions as the set of rules actually used by a set of individuals to organize repetitive activities that produce outcomes affecting those individuals and potentially affecting others.

According to Cousins (1995), local institutions for regulating resource use had existed in sub- Saharan Africa since pre-colonial era. However, most of these institutions lost their authority and legitimacy during the colonial era. The subordination of customary authorities such as chiefs and headmen to repressive state apparatuses has undermined the legitimacy of these institutions (Cousins, 1995). Natural resources were taken from the hands of the local people and became state lands. This act undermined the sense of local responsibility for resource management, a legacy that proved increasingly problematic (Sarin, 1993; Matose and Wily, 1996). IRD (2000) reports that historically, West African civil society has been suppressed by a highly centralized central regime instituted under colonialism that has largely been maintained under nearly 40 years of independence. This highly centralized structure dominated customary local governance constraining it to village arena. Today a far-reaching restructuring is beginning to take place. There is general recognition in the region that central government are poorly placed to make many decisions appropriate for local levels. Particularly in areas of agriculture and natural resource management (NRM), local populations are being asked to take leadership in deciding appropriate land uses and ownership of resources.

2.4.6 Institutional arrangements affecting land resource allocation and use

Institutional factors have far reaching effects on land resource allocations because of the role they play in determining what practices are acceptable and what resources can be used

(Barlowe, 1986). Resource users actions are restricted by the nature of the rights they hold in property. Ownership involves rights to the possession and use of a resource. It involves a complex of rules and procedures, which determines how the resources are owned, leased, mortgaged and legally transferred to others. As such it represents a powerful institutional constraint that guides resource use. Operators can use and exclude others from the use of properties they own, hence creating conflict.

IIED (1994) observed that people living adjacent to the protected areas have found themselves deprived of resources, which for thousands of years they have had the right to utilize. As human populations have grown, demands on limited resources have increased and the intensity of conflicts between conservation authorities and local people has escalated. In Ethiopia, for example, violent conflict broke out as a result of restrictions on firewood cutting in Simien National Park. When Namibia became independent in 1990, Ovambo tribesmen living on the boundary of Etosha National Park celebrated their freedom by cutting the game fence and driving into the park armed with guns to hunt for meat for their families. Elsewhere local resentment has manifested itself in acts of poaching and vandalism, such as the deliberate starting of fires, poisoning of animals and attacks on park guards (*Ibid*).

For many years these conflicts have been settled through police action, with many men being sent to prison, or even shot as poachers. Conservation laws, reserves and game rangers have come to be regarded as enemies of the local people.

In Zimbabwe, reported conflicts are between communities over boundaries for grazing areas (Cousins, 1989), within communities, over individuals attempting to privatize

communal resources and among institutions, over the control and management of key communal resources (Scones and cousin, 1991). For example, in the case of Zimbabwe, 80% of the population, mainly blacks, were confined to 20% of land and this resulted into shrinking of communal land size available to a given population. This, in turn led to competition over the scarce resources (Fortman, 1995).

Juma and Ojwang (1996) observed that in Kenya the centralization of natural resources management transferred management from the local communities to government institutions such as Forest Department. In parallel to this action, the local people were confined to over crowded native reserves. The legacy of this tenure change was denial of access to resources and advent of conflicts with state institutions that persist up to the present.

This has resulted in inequities in distribution and denial of access to natural and land resources. The existing institutional framework created conflicts by disenfranchising indigenous people. Further the existing policies confer upon the state, overriding management powers over land resources, thus weakening traditional natural resource management regimes.

2.4.7 Villagisation policy in Tanzania

Cousins (1996) noted that the policy of villagisation in Tanzania imposed an alien system of government, statutory law and decision-making on indigenous systems with administrative and political functions being transferred from traditional leaders to village and district councils. Villagisation also disrupted customary land tenure, land being nationalized in 1962. Huggins (1999) observed that across Tanzania, the creation of

nucleated settlements (Ujamaa villages) has more than doubled human and stock densities, leading to pockets of intensive land use, which are often locations of land- tenure disputes, and environmental degradation. The villagisation programme of the 1970's altered land use patterns radically within few years. The process involved substantial changes in land-use rights for the purpose of re-distributing land for infrastructure, agriculture, and habitation.

2.4.8 Liberalization of the economy in Tanzania

Cousins (1996) argues that liberalization of the economy has increased possibilities for marketed crops and encouraged individuals and companies to acquire land for commercial farming. In Simanjiro district, for example, some 20,500 hectares had been acquired for 72 farms by 1993, almost all alienated from former livestock pastures. In northern Tanzania the interest of conservationists and tourism industry have also come into conflict with pastoralists and hunters and gatherers with many of the latter groups being forcibly removed from protected areas. More and more pastoralists have been pushed into marginal areas, herds have declined and people have been forced into crop farming.

2.4.9 Policies, laws and regulations

Kaboggoza (2000) points out that forest policies, laws and regulations have a considerable impact on the conflicts involving forest dependent communities, particularly the disadvantaged and marginalized groups. These groups, mostly the poor, women, and indigenous peoples are the most dependent on forest and trees. Policies, along with the laws and regulations enacted to implement them, can mitigate conflicts, create new, or exacerbate existing ones. However, conflicts that involve forest-dependent communities are seldom taken into account when formulating forest policies, an omission that often further marginalizes and disadvantages them.

2.4.9.1 National Forest Policy

Government forest reserves, i.e. gazetted forests, are constantly threatened by encroachment and shifting cultivation resulting from a high population pressure. Wildfires are taking place annually affecting both natural forests and plantations. Lack of systematic management, unclear boundaries and inadequate resources for controlling these forest reserves have led to illicit tree cutting and grazing in the forest hence creating conflict. (URT, 1998). Fortunately, the new Tanzania Forest Policy address remedies to these weaknesses.

2.4.9.2 The wildlife policy of Tanzania

Despite her long-standing history of wildlife conservation, Tanzania had never had any comprehensive wildlife policy (URT 1998). Wildlife was all along being protected and utilized by use of guidelines, regulation and laws implemented by department of wildlife and other institutions entrusted with responsibility of conserving the same. At independence in 19961, Tanzania human population was relatively low (only 8 million) making land use conflicts uncalled for. Parts of the land could be easily set aside for protection of wildlife without seriously inconveniencing local people. Today the Tanzania human population is about 35 million, with advancement of science and technology, both of which make land scarce and necessitate land use plans and elaborate wildlife conservation policy (*ibid*). Fortunately in implementation of the new policy, it interacts with other sectoral policies such as tourism, agriculture, water, minerals and environment.

2.4.9.3 Wildlife Management in reserved forests

It has been spelled out in Tanzania National Forest Policy (URT1998) that encroachment, wildfires, illegal logging and poaching in the reserved forests have contributed to the

deterioration of the wildlife population. Baseline data on wildlife species and their habitats outside game reserves and national parks is scarce and wildlife management is not incorporated in current forest management plans. Coordination between government institutions involved in wildlife and forest management is poor. Some forest reserves overlap with game reserves or game controlled areas, causing conflicts in management activities. Inadequate infrastructure and financing within wildlife and forest sector have further exacerbated the situation. The types of conflicts cited above underlines the need to make conflict management a central feature of policies and should include programmes aimed at promoting sustainable livelihoods in the context of multiple land use.

2.5 Conflict management

FAO (1997) observed that there is growing awareness of the conflicts over access to and use of natural resources that occur within and between communities, government agencies, NGOs, private enterprises and other resource users. There has long been recognition that conflicts over natural resources occur, some latent and embedded within the community and society, others precipitated by external forces. However, only recently has conflict management received the level of attention that is needed to understand the complex links between natural resource management and factors such as utilization, access, direct and indirect benefits and equity.

2.5.1 Community based conflict management

FAO (1997) continue to point out that in north-eastern Thailand many people live in or near forest areas that have been declared national forest reserves, and have no rights concerning land management. Conflict began when the Royal Forest Department of Thailand tried to resettle local villagers in an attempt to conserve the remaining forest and

watershed. Although the local villagers did not have recognized rights over the land they occupied, they felt that it was not fair for them to be forced to leave since they had lived in the forest before it was declared a National Forest Reserve.

More than four years after the conflict emerged. FAO (1997) continue point out that an agreement was finally reached with participation from villagers' representatives, the governor, forest officers, local police and Members of Parliament from the area. It was agreed that those who occupied land classified as watershed would move and the government would find land for them. If land could not be provided, government would pay compensation. The villagers who occupied land outside of watershed area would be granted land title. All parties signed the agreement, and the villagers formed a committee to prepare a project to manage the forest under community forestry principles.

Scott (1998), pointed out that in keeping with global view that protectionist management strategies are inappropriate and simply do not work, in Uganda for instant, the parties involved in management of Mount Elgon National Park decided it was time for a change in management approaches. Mount Elgon had a history of all types of conflict; between tribes, between residents and cattle rustlers and between locally resident populations and protected area authorities. All of these conflicts had generally negative impact on the resource and were constraints to the effective management of the protected area. Cooperation between the park authorities and locally resident people was found to contribute to the resolution or at least management of some of these conflicts. This was done through investigating the nature of the resource use and the role the local population could play in management. To facilitate this the National Park authorities were offered support in initiating community based management activities.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Description of the study area

3.1.1 Location

Mount Meru area is within Arumeru district Arusha region, in northeastern Tanzania. Arumeru district lies within latitude 3°00'S to3°06'S and longitude 36°04'E to 37°00'E.The district is bordered by Monduli district in both northern and western parts, Hai district in the eastern part and western part and Kiteto district in the southern part. The district has 6 divisions (Figure 2) 32 wards, and a total of 133 villages.

3.1.2 Demography

Two main ethnic groups inhabit Arumeru district, the Waarusha on the West of mount Meru and the associated plains and Wameru on the eastern slopes of the mountain and the adjacent areas in the lowland. Hence name Arumeru bears a combination of the names of the two tribes. Waarusha are an offshoot of the Maasai who adopted a more settled pattern of farming (Anon, 1980), unlike the Maasai who are migrant pastoralists. According to the 2002 population and housing census, the Arumeru district was the most densely populated district in Arusha region. With an area approximately 3 000 km^2, it has a population of about 516814 people of whom 50.9% were female and 49.1% were male. Around Mount Meru area population density is high (about 174 people per km^2). More than 90% of these people live in the rural areas. The population is increasing at a rate of 4% annually (URT, 2003).

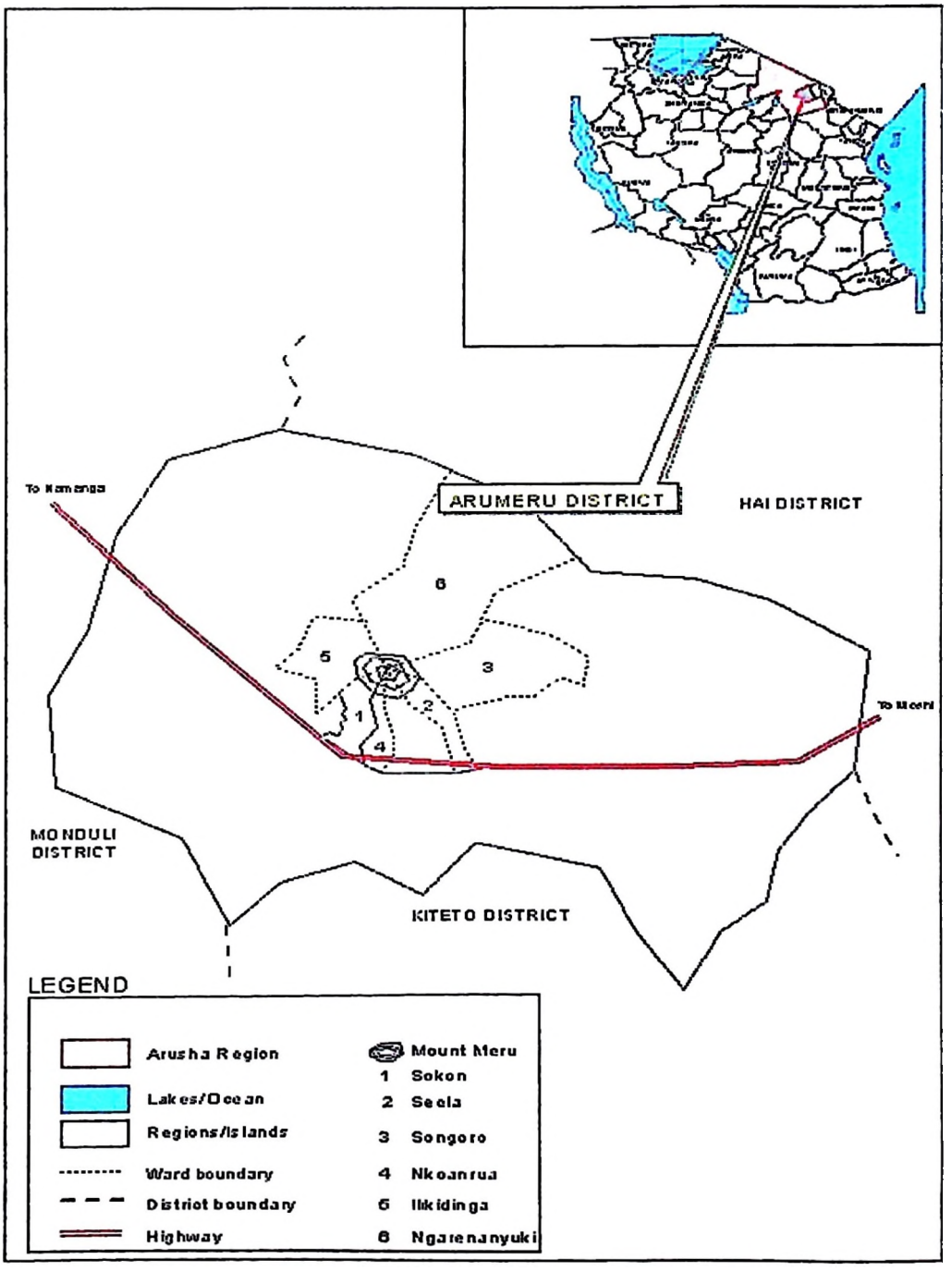

Figure 2: A sketch map of Arumeru District showing sampled wards

Source: Bureau of Statistics (1988)

3.1.3 Topography and rainfall

The area has a bimodal rainfall pattern with long rains from March to May and short rains from November to December. The mean annual rainfall varies from 800 mm to 1500 mm. Temperature ranges between 15° C and 28°C during the year hence the climate is generally cool. Extreme cases do not occur and thus frost occurrence has never been experienced except at higher altitudes beginning 1600 metres above sea level. The topography in the area is highly influenced by Mount Meru hence cool temperature and heavy rains. With the exception of steep slopes towards higher altitudes, the rest of the area has few steep slopes often exceeding 20%. However, in most areas the slopes are moderate. Numerous perennial and seasonal streams, which flow down the mountain dissect the slopes, the main ones being Engarenarok, Temi, Nduruma, Tengeru, Malala, Maji ya Chai and Usa rivers.

3.1.4 Geology and Soils

According to Soil Conservation and Agroforestry Programme Arusha (SCAPA 1998), soils of Arumeru district are volcanic in origin, resulting from Mount Meru, which is an extinct volcano. The rocks are volcanic, varying from coarse vesicular grey lavas, to fine grained basalts. These are overlain by deep soils originating from volcanic ash, and generally classified as andosols. As a consequence the soils erode easily and have low bearing strength. Moreover, the soils are very loose when dry, and when loosened by feet, hooves or wheels and can easily be eroded if disturbed, hence highly susceptible to soil erosion. The most fertile land with high rainfall is on the moderate and steep slopes of mount Meru and associated with most land under cultivation. The plains with low rainfall are used as rangelands with dense livestock populations.

3.1.5 Vegetation

The steep slopes of Mount Meru are surrounded by both indigenous and planted forest. The southern side on the steep slopes, has a well developed montane forest belt, while some indigenous forests are protected as national, district, or village reserves (Mwakatobe, 2001). The Central government owns Meru Forest, which was gazetted as a Government Forest Reserve vide Government Notice No.232 of 1920 with an initial total gazetted area of 44,799 hectares (MLNRT, 1989). This area was reduced subsequently with the Government establishment of a softwood forest plantation and Arusha National Park vide G.N. No.242, 546 and 84 of 1960, 1964 and 1967 respectively (MLNRT, 1989). With the establishment of the softwood plantation and Arusha National Park, the area covered with indigenous/catchments forest is approximately 26,444 hectares. According to Kimbi *et al.* (1998), the dominant tree species in indigenous forest includes; *Cordia africana*, *Olea capensis*, *Combretum* spp., *Croton spp.*, *Albizia* spp., *Persea americana*, *Cordia abyssinica*, *Raufolvia caffra* etc. Grass and herb species include Maasai love grass, African foxtail, *Tripsacum laxum*, *Pennisetum purperum*, *Desmodium* spp., and Devel's horsewhip. The Plantation forest is normally planted with fast growing exotic tree species such as *Cupressus lusitanica*, *Pinus patula*, *Pinus ellioti*, *Grevillea robusta*, and various Eucalyptus tree species.

3.1.6 Land use and tenure

Most of the land around Mount Meru is owned by the Central Government, under Mount Meru Catchments Forest Reserve, Mount Meru Forest Plantations and Arusha National Parks. As a result there is land shortage in the district and the farmland is highly fragmented with holdings ranging from 0.2 hectares near the highways to 2.0 hectares at higher elevation (Mwakatobe, 2001). The majority of the farmers have less than a hectare

(average of 0.8 hectares). Consequently, land conflicts have arisen (Mlay, 1992). This severe land shortage and the fact that nearly all available land is intensively cultivated, hampers traditional efforts to increase production and satisfy food demand. Land tenure is based on inheritance system with land being divided among sons. However, some widows and unmarried women can own plots, which are mainly acquired by buying. Though women have no right to own land, they have user-rights by virtue of marriage. Women, however, constitute the majority of subsistence farmers; they work to provide the families with foods and other household needs.

3.1.7 Land once under big farms

Arumeru district has several big farms, which occupy extensive land portion. Owners following the Nationalization Policy of 1967 abandoned some of such farms. In 1999 for instance, 13 of undeveloped farms had their leases revoked and were to be redistributed to people with no land or very small land areas. District Administration succeeded to redistribute only 5 farms. The remaining 8 farms their owners surfaced and produced court injunction. Currently there are potentially 3 farms to be divided among the local residents (Verbal communication with District Lands Officer). Following the acute land shortage in the district, these strategies are not adequate to alleviate the land scarcity.

3.1.8 Farming systems

3.1.8.1 Agropastoral systems

This system is common among the Waarusha people who inhabit most of the western part of Mount Meru slopes. It is believed that the Waarusha tribe was constituted out of small groups of Maasai who have settled to become agropastoralists practicing mixed farming. Generally, they have adopted a settled pattern of living, with integrated system of

crops and livestock on permanent settled villages. The on-farm production is based on subsistence home gardens, which entails mixture of crops like coffee as the main cash crop. Other crops include pyrethrum, banana, potatoes maize and some vegetable crops.

Large proportion of livestock grazing in the western parts of Arumeru district is on communal lands. As a result of increasing pressure on the rangelands, the grazing of animals is changing more towards private lands (Mkeya, 1994). Private grazing lands in the mountain areas are on small plots around homesteads. However, because the sizes are small, supplementary feeding is necessary. The composition of livestock varies among the households. Livestock contribute to farming system by providing food and other products such as skins and hides and traction power (Kayumbu *et al.*, 1998).

3.1.8.2 Subsistence agriculture

The historical production systems of the Wameru who inhabit southeastern slopes of Mount Meru is based on subsistence agriculture with large emphasis on crop production. The crop production by small-scale farmers is based on subsistence home gardens, which entail mixture of crops like coffee as the main cash crop, banana, potatoes, maize, beans and variety of vegetable crops.

Through interaction with the Waarusha, the Wameru have developed interest in livestock production. Although livestock numbers are not large in comparison to those of the Waarusha, livestock has become part of the social system and it is done through improved breeds especially dairy cows, which are stall-fed.

3.1.9 Communication

Mount Meru area is situated in the northern part of Arusha Municipality, the regional headquarters and business centre for the region. The Municipality is linked to the rest of the country through roads, rail, and air. Access to the sea is by roads or railway to Tanga, Dar-es-Salaam, or Mombasa in Kenya. Air link is through the International Airport in Kilimanjaro, some 55 km from Arusha. The area has small suburban centres; these include Ngaremtoni, Oldonyosambo, Tengeru, Usa, Leguruki, King'ori and Ngarenanyuki.

3.2 Methods of data collection

3.2.1 Primary data collection.

A purposeful identification was used to select Wards surrounding Mount Meru area. After getting acquinted with Wards, the villages bordering the reserves were selected for sampling. A list of villagers in village registers from selected villages was the sampling frame.

Table 1: Total number of households in the study area and percent of sampled household

Ward	Village	Total number of households	Number of sampled households	Percent of Sampled household
Sokon	Ng'iresi	300	15	12.1
Seela	Seela	400	20	16.1
Songoro	Songoro	180	7	5.6
Nkoanrua	Nkoanrua	400	22	17.7
Ilkindinga *	Timbolo	180	7	5.6
	Sambasha	500	20	16.1
	Shiboro	350	20	16.1
Ngarenanyuki	Kisimiri	250	13	10.5
		2560	124	100

* The Ward has an extensive longer border with the forest reserves.

During sampling the first household was picked using random numbers. The sampling interval was obtained by dividing the number of households in the village by the number required in that village. A household was picked every other time after the sampling interval. Sampling was done in such a way that sampling fraction (n/N) should at least constitute 5% of the total population so as to be representative (Boyd *et al.*, 1981), where n=sampled households and N= population of households. In total the sample consisted of 124 households out of (2560) households of the study area. The list of villages and percentage of households sampled are presented in table 1.

Data collection focused on:

a) Shared information - through Participatory Rural Appraisal

b) Household interviews -through Structured questionnaires and participant observation

c) Deep knowledge about the problem - through unstructured surveys /checklists.

3.2.1.1 Shared information

General information was gathered from villages, making use of interdisciplinary team working close with the local people, village leaders and groups of villagers prior to household structured questionnaire. This was done through Participatory Rural Appraisal, based on interactive learning, sharing of knowledge in order to get general information about the community under study. The methods used included direct observations through transect walk, informal discussions, resource mapping, venn diagramming and time lines. The generated information about the study area gave the picture of local conditions within a short time prior to the main data collection. The two sources of information complement each other.

3.2.1.2 Household data

Structured questionnaire (Appendix 1) was used based on specific objectives. Pre-testing of the questionnaire was done at the outset of the research using few households from randomly selected villages in order to check the applicability of the questionnaire and easiness of recording the data from the respondents. The aim was to pre-test the questionnaire and modify it to match the local conditions.

Participant observation enabled the researcher to be involved in making a physical survey in the community by doing interviews to heads of households to study activities with reference to agriculture, livestock production and forestry. Size of farms and grazing areas were measured. With regards to forestry, a survey of tree planting activities at both household and village level was done. The information gathered supplemented the information from structured questionnaires.

Type of data was as follows;

(i) Socio-economic data:-

Village human population, family size, ethnic composition, population distribution, family division of labour, family income, resource allocation, local institutions, labour pattern, level of education, and age class distribution.

(ii) Bio-physical data:-

Land use patterns, vegetation (natural, cultivated), climate, land degradation, use of improved seed varieties, use of fertilizers, use of improved livestock breed and neighbouring natural resources.

3.2.1.3 Deep knowledge about the problem/Checklist

Through use of checklists the researcher had a chance to obtain information from key informants and focus groups that would have expected to have a greater depth of knowledge about the issue in question. A key informant for that matter is an individual who is accessible, willing to talk and has great knowledge about issue in question. These included such people as District Natural Resources Officer, District Lands Officer, SCAPA Program Coordinator, Arusha Catchments Forest and Meru Forest Plantation Managers, Divisional Secretaries, Village secretaries, and Park Warden, Arusha National Park. Checklists were used to obtain information, which would supplement formal questionnaires (Appendix 2 and 3).

3.2.2 Secondary data

Data in this category was obtained from records and reports in the district and village offices, other organizations working in Arumeru district and also from various literatures concerning the study area. The data provided information on general aspects and specific issues such as records of land disputes, role of community in management of natural resources (forest and wildlife reserves), pastoral migration patterns, and institutional problems affecting land use.

3.3 Data analysis

The quantitative and qualitative information collected through structured questionnaire was coded to facilitate data entry and statistical analysis using standard computer softwares i.e. SPSS and Excel.

3.3.1 Descriptive statistics.

This was employed to analyse quantitative data to obtain percentages, frequency counts, histograms, and pie charts of variables including education level, family annual income, farm use, livestock ownership, forest use, wildlife use, noted conflicts, cash and food crop production and productivity increase endeavours.

3.3.2 Inferential statistics

The function of inferential statistics was to provide an idea about whether the patterns described in samples were likely to apply in the population from which the sample were drawn. In this regard therefore, multiple linear regression function was developed to show the impact of illegal grazing, as dependent variables and total agricultural land owned, tribe, total number of livestock and place of grazing, as independent variables.

Illegal grazing livestock in the reserves – The existence of illegal grazing livestock in the reserves is a dependent variable because it was hypothesized that it is the impact influenced by several factors.

The independent variables were taken to be:

- Total agricultural land owned: Since farmland is supposed to provide feeds for the livestock, total agricultural land owned was considered an important factor. Therefore it was hypothesized that all things being equal, farmers with bigger farm size would have enough area to allocate area for grazing as well as growing fodder.
- Total number of livestock: Total number of animals owned (herbivorous animals) considered here cattle, sheep, goats and donkeys. It was hypothesized that increase in animal stock per household has infuence on the dependent factor.
- Place of grazing: Since place of grazing is supposed to be within

farmers' farmland, place of grazing was considered an important factor. Therefore it was hypothesized that increasing lack of places of grazing within farmers' farmland and communal land, farmers with big herds of livestock will take their animals to the reserves.

- Mode of production: Since the area is inhabited by both peasant farmers and agropastoralists, it was hypothesized that increase of agropastoralists in the area (traditionally they feel a prestige to own big herds of cattle), will increase the number of animals in the area while no communal grazing areas available.

The analysis assessed the following:

i. Whether dependent and independent variables are related.

ii. To measure the strength of relationship between dependent and independent variable.

The regression equation is as shown below;

$$Y= \alpha + \beta_1 x_1 + \beta_2 x_2 + \text{----------} + \beta_i x_i + e$$

Where:

Y_i = The i^{th} observed value of dependent variable (Livestock grazing illegally in the forest)

X_1 - X_i = Independent variables (total agricultural land owned, mode of production, where livestock are grazed and number of livestock).

α = Intercept

β_1 - β_i = Independent variables coefficients

e = Random error

I= 1,2,....., n. where n is the total number of variables.

In this study the regression coefficients (β) were used to predict the impact of the independent variables on dependent variables. To assess the explanatory power/goodness of fit to regression model a coefficient of determination (R^2) was employed. R^2 shows the strength of relationship between dependent and independent variables. The test of significance was chosen to be done at 1% level of significance, using a two-tailed t-test by testing the hypotheses:

H_o: ($\beta = 0$) – Meaning that there is no correlation between dependent and independent variables

H_1: ($\beta \neq 0$) – Meaning that there is positive or negative correlation between dependent and independent variables.

Null hypothesis was rejected when ($p < 0.01$).

3.3.2.1 Fitting for the Linear regression model applicable for this study

In fitting a regression model to a particular set of data, the relations between predictor variables were investigated, for multicollinearity Multicollinearity (collinearity or intercorrelation) is a condition that exists when the independent variables are correlated with one another. The adverse effect of collinearity is that the regression coefficients β_1 β_2 etc tend to have large sampling variability. According to Kennedy (1985), a correlation coefficient greater than 0.8 indicate presence of multicollinearity. The data included in the models were checked by correlation coefficients and found not to suffer from multicollinearity (Appendix 4). According to Keller and Warrack (1997), in minimizing the effect of multicollinearity one must try to include independent variables that are independent of each other.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Overview

This chapter presents the results of the study and gives a summary of land use conflicts in Mount Meru area in Arumeru district, as found during the survey. The results and discussion are organized in five main subsections, namely, socio economic factors affecting land use, types of existing land use practices, land use conflicts and their causes, local strategies for management of conflicts and institutional measures for management of prevailing resource conflicts. Suggestions for management approaches to mitigate these conflicts while instituting wise use of land and other natural resources are presented in chapter five.

4.2 Socio economic factors affecting land use

4.2.1 Household characteristics

Household sizes and composition in many societies determine the population level, growth characteristics and resource use pattern (Mkeya, 1994). The household size in the study area ranged between 2 to 16 persons per household with a mean of 7 persons per household. This is much higher than the region's average household of 4.5 people (URT, 2003). This has an influence on population of Mount Meru area. As observed by Mbwillo (2002), rural households are larger and complex than urban households because of strong kinship links and the nature of subsistence economy. In rural areas like those of Mount Meru large household sizes are desired because the household would like to cultivate more land, and to take care of livestock with the help of extra family labour. Obviously the more the number of people in the same household, the more the mouth to feed and so more land

is required to produce the required foodstuffs and other requirement of the household. Given the limited area for expansion of both crop and livestock production, one of the strategies pursued by farmers to meet such demands is to encroach into the forest reserves for cultivation and graze animals illegally, thus causing land use conflict in the area.

4.2.2 Education level of heads of households

Education is an important ingredient for development. Kajembe and Luoga (1996) pointed out that education tend to create awareness, positive attitudes, values and motivation. Education also tends to stimulate self-confidence and self-reliance therefore there may not be development without education. Amani, (1996) asserts that given anything else, educated households are more productive in agriculture and likely to have more off-farm income earning opportunities than the non-educated. One with low education cannot get formal employment in labour market but will remain in the village, consequently increasing unemployment among the local populations. Thus, education promotes better management of household resources and reduces pressure on the easily accessible natural resources.

In the study area, on average, respondents with primary education constituted the highest population, 63.7%. Those with no formal education constituted the second highest proportion, 17.7%. Those with secondary and adult education constituted 8.9% and 7.3% respectively. Consequently this may lead to low awareness on matters regarding to land management and resource conservation among households with no formal education. In comparison, the proportions of those without formal education were higher in Sambasha and Shiboro villages, which are purely inhabited by the Waarusha people as presented in Table 2. This might be due to the nature of the inhabitants who are agropastoralists and most probable very much tied to their livestock herds.

Table 2: Education level of respondents in the study area (%)

Education level	Ng'iresi (n=15)	Seela (n=20)	Songoro (n=7)	Nkoanrua (n=22)	Timbolo (n=7)	Kisimiri (n=13)	Sambasha (n=20)	Shiboro (n=20)	All (n=124)
No formal education	0(0)	0(0)	14.3(1)	27.3(6)	0(0)	0(0)	35.0(7)	35(7)	17.7
Adult education	0(0)	0(0)	0(0)	0(0)	28.6(2)	7.7(1)	15(3)	15(3)	7.3
Primary education	93.3(14)	90.0(18)	57.1(4)	45.5(10)	57.1(4)	92.3(12)	40.0(8)	45(9)	63.7
Secondary education	6.7(1)	10(2)	28.6(2)	18.2(4)	14.3(1)	0(0)	5.0(1)	0(0)	8.9
Others	0(0)	0(0)	0(0)	9.1(2)	0(0)	0(0)	0(0)	5(1)	2.4
Total	100	100	100	100	100	100	100	100	100

Figures in parenthesis indicate number of respondents.

The study also shows Ng'resi, Seela, and Kisimiri villages are leading with proportions of those with primary education than other villages while Songoro and Nkoanrua villages are leading with proportions in secondary education. With exception of Ng'iresi, which is close to Arusha municipality and inhabited by the Waarusha, Seela, Kisimiri, Songoro and Nkoanrua, which are inhabited by the Wameru, constitute farmers who have adopted more of zero grazing of dairy cattle hence more room for children to attend school. This may have implication that by not attending school, there is labour force to take care of big herds of livestock.

4.2.3 Income

The study shows on average that 66.1% of the respondents in the study area get gross annual income between TAS 200,000 – 400,000. This is followed by 17.7%, which get below TAS 200, 000 annually. Generally, the study shows that on average 54.0% of the respondents depend on crop production as the main activity that gives them income,

followed by 25.8% for livestock production as presented in Table 3. The low livestock production might be due to less adoption of stall fed improved cattle breeds in most of the areas. The study reveals further that Songoro and Nkoanrua lead accounting for 57.1% and 63.6% respectively in livestock production in respect of dairy products, as compared to say, the villages inhabited by Waarusha (Agropastoralists). This is due to the fact that the Wameru have adopted zero grazing of improved cattle breed. This reflects that with low income, one can not acquire more land through purchasing, improve farm productivity through farm inputs e.g. fertilizers and improved seeds as well as buying concentrates for supplementing livestock feeds, consequently turning to forest reserves as an alternative to increase land for crop production and grazing of livestock. Table 3 present incomes by activity in the study villages.

Table 3: Income by activity in the study villages (%)

Activity	Ng'iresi (n=15)	Seela (=20)	Songoro (n=7)	Nkoanrua (n=22)	Timbolo (n=7)	Kisimiri (n=13)	Sambasha (n=20)	Shiboro (n=20)	All (n=124)
Crop production	80(12)	40(8)	42.9(3)	27.3(6)	57.1(4)	84.6(11)	50(10)	65(13)	54.0
Livestock production	13.3(2)	30(6)	57.1(4)	63.6(14)	14.3(1)	15.4(2)	10(2)	5(1)	25.8
Crop&casual Labour	0(0)	20(4)	0(0)	9.1(2)	0(0)	0(0)	10(2)	5(1)	6.2
Temporal/ government employment	6.7(1)	10(2)	0(0)	0(0)	28.6(2)	0(0)	20(4)	15(3)	11.2
Other (including mining)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	10(2)	10(2)	2.8
Total	100	100	100	100	100	100	100	100	100

Figures in parenthesis indicate number of respondents.

Timbolo, Sambasha, and Shiboro villages indicated higher proportion in income from temporal and permanent government employment, 28.6%, 20.0% and 15.0% respectively due to the fact that they border forest plantations where various management activities are performed, as presented in Table 3.

4.2.4 Crop production

The main crops produced in the study area are coffee, pyrethrum, banana, Irish potatoes, maize and beans, as well as variety of vegetables. The production system in many societies around Mount Meru area is based on subsistence home gardens that entail a mixture of crops like coffee, banana, vegetables and few portions of maize and beans.

Among the 124 respondents interviewed, on average 45.0% indicated coffee to be the main cash crop, followed by 15.3% a combination of coffee and vegetables and vegetables 13.7%. Arumeru district accounts for about 68% of coffee production in Arusha region (URT, 1998), but the production is considered stagnant and in other

places declining due to diseases and prohibitive prices of pesticides. The type of crops by percent of households reporting to have grown them in the study area is shown in Type of crops in the study villages are presented in Table 4.

Table 4: Type of crops by percent of households growing them in the study area

Type of cash crop	Ng'iresi (n=15)	Seela (20)	Songoro (n=7)	Nkoanrua (n=22)	Timbolo (n=7)	Kisimiri (n=13)	Sambash a (n=20)	Shiboro (n=20	All (n=124)
Coffee	6.7(1)	73.3(15)	50.0(4)	85.7(19)	100(7)	0(0)	0(0)	0(0)	45.0
Pyrethrum	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	7.7(3)	7.1(1)	1.8
Vegetables	20.0(3)	6.7(1)	10.0(1)	0(0)	0(0)	20.0(3)	23.1(5)	35.7(8)	13.7
Maize	6.7(1)	0(0)	0(0)	0(0)	0(0)	0(0)	46.2(9)	7.1(1)	7.2
Potatoes	53.3(8)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	35.7(8)	10.6
Beans	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	7.7(3)	0(0)	0.9
Coffee& Vegetables	13.3(2)	20.0(4)	40.0(2)	14.3(3)	0(0)	40.0(5)	0(0)	7.1(1)	15.3
Maize& Potatoes	0(0)	0(0)	0(0)	0(0)	0(0)	40.0(5)	0(0)	0(0)	4.7
Maize& vegetables	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	7.1(1)	0.8
Total	100	100	100	100	100	100	100	100	100

Figure in parenthesis indicate the number of respondents.

The trend for food crops shows that a combination of banana, maize and beans is leading for food crops production 36.3%, followed by banana 15.3%, a combination of banana, maize and potato 14.5% then maize 12.9%. Percentages for other crop combinations and/or individual crops are presented in Table 5.

Table 5: Type of food crop combinations by percent in the study area

Type of Food crops	Ng'iresi (n=15	Seela (n=20)	Songoro (n=7)	Nkoanrua (n=22)	Timbolo (n=7)	Kisimiri (n=13)	Sambasha (n=20)	Shiboro (n=20)	All (n=124
Banana	0(0)	25(5)	0(0)	63.6(14)	0(0)	0(0)	0(0)	0(0)	15.3
Maize	0(0)	0(0)	0(0)	0(0)	0(0)	15.4(2)	40(8)	30(6)	12.9
Beans	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	5(1)	5(1)	1.1
Banana& Potatoes	40(6)	5(1)	28.6(2)	0(0)	0(0)	0(0)	0(0)	0(0)	8.2
Banana& Maize	6.7(1)	0(0)	14.3(1)	9.2(2)	0(0)	7.7(1)	5(1)	5(1)	5.4
Banana/maize/ Potatoes and Beans	26.7(4)	15(3)	0(0)	0(0)	14.3(1)	0(0)	0(0)	0(0)	6.3
Banana/maize/ Potatoes	6.7(1)	15(3)	14.3(1)	0(0)	14.3(1)	46.2(6)	10(2)	20(4)	14.5
Banana/maize/ Beans	20(3)	40(8)	42.9(3)	27.3(6)	71.4(5)	30.8(4)	40(8)	40(8)	36.3
Total	100	100	100	100	100	100	100	100	100

Figures in parenthesis indicate the number of respondents.

For communities bordering forest plantation annual crops like Irish potato, maize and beans are mostly produced through taungya system. The history of taungya system in Meru/Usa forest plantations dates back in the 1950s when the forest plantation was established as part of Mount Meru reserve. Taungya is a Burmese word, which means 'Hillside agriculture'. Farmers were given plots in clear-cut areas of the forest to grow perennial crops after which a new forest crop is established. The taungya system exploits the availability of light and growing space in the period before canopy closure. Agricultural annual crops such as potatoes, maize, beans and peas are established between rows of trees.

When the tree crop closes the canopy, the farmers are required to abandon growing the annual crops in the plots. This is a kind of an incentive from the forest plantation management to local people, which may be important in building positive attitude

among them and management of the plantation, but with increased population pressure the move never suffice the needs hence a potential source of conflict, because the per capita area to be distributed becomes less as population increases.

4.3 Types of existing land use practices

4.3.1 Land acquisition and tenure

By definition land tenure implies the right to use the resource held in land (FAO, 1989). People around Mount Meru area own and use land on individual family basis. Land is always inherited through sons, while on the other hand women have no right to own land, but have user rights by virtue of marriages. Buying and renting of land in Mount Meru area is a rare practice. However, with taungya system the farmers have to pay annual fee of TAS 2,500 for a plot of about 0.2 ha to cultivate food crops. The government own the land in the form of forest reserves, i.e. Mount Meru Forest Reserve, which comprise of catchment and plantation forests, and the Arusha National Park owns most of the land around Mount Meru area. The study showed that among 124 respondents interviewed during the survey, 85.5% owned the land through inheritance, while 11.3% bought and inherited. Only 3.2% of the respondent bought the land from other villagers (Table 6). Due to limited land area, farm boundary shifting between heirs is prevalent. Moreover, it is impossible for every farmer to get a plot in the clear felled forest areas hence creating conflict between villagers and forest staffs.

Table 6: Mode of land acquisition by villages in the study area (%)

Method of land acquisition	Ng'iresi (n=15)	Seela (n=20)	Songoro (n=7)	Nkoanrua (n=22)	Timbolo (n=7)	Kisiriri (n=13)	Sambasha (n=20)	Shiboro (n=20)	All
Bought	6.7(1)	0(0)	0(0)	0(0)	0(0)	23.1(3)	0(0)	0(0)	3.2
Inherited	86.7(13)	70.0(14	57.1(4)	100(22)	100(7)	46.2(6)	100(20)	100(20)	85.5
Bought and inherited	6.7(1)	30.0(6)	42.9(3)	0(0)	0(0)	30.8(4)	0(0)	0(0)	11.3
Total	100	100	100	100	100	100	100	100	100

Figures in parenthesis indicate number of respondents.

4.3.2 Land use for agricultural production

Land around Mount Meru area is owned and used on individual family basis, and is inherited from one generation to another though sons. Consequently the land under household is continuously decreasing because of being subdivided between heirs. However, in some instances land is bought, sold and developed privately if family members agree and the village government endorses.

The study showed that 13.7% of the respondents used the land solely for crop production. About 83.1% of the respondents used the land for crop cultivation and growing of fodder on the same piece of land. Only 8.0% of respondents used the land for fodder production. The study further revealed that average agricultural land owned per household in the study area is 0.8ha. Out of this area 0.2ha is allocated for grazing and this was common in areas predominantly inhabited by the Waarusha people.

The cash crop is mainly coffee, while food crops are banana, maize, potatoes and beans. The same piece of land holds an average of 11 livestock per household.

Land availability for crop production and livestock keeping is still a big problem in most of the studied villages Among 124 respondents interviewed during the study, 91.9% indicated that the land holdings were not enough for crop production. Responses from individual villages on adequacy of land for crop production are presented in Table 7. Ninety two point seven percent indicated that the land holding were not adequate for grazing the livestock as presented in Table 8. This reflects that land is not adequate for both crop and grazing of livestock. Since there is no room for expansion, the only alternative has been the forest reserves hence causing conflict with the respective management, which is taking care of the reserves.

Table 7: Response on land adequacy for crop production by village in the study area (%)

Land adequate for crop production	Ng'iresi (n=15)	Seela (n=20)	Songoro (n=7)	Nkoanrua (n=22)	Timbolo (n=7)	Kisimiri (n=13)	Sambasha (n=20)	Shiboro (n=20)	All (n=124)
Yes	33.3(5)	5(1)	0(0)	9.1(2)	0(0)	15.4(2)	0(0)	0(0)	8.1
No	66.7(10)	95(19)	100(7)	90.9(20)	100(7)	84.6(11)	100(20)	100(20)	91.9
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100

Figures in parenthesis indicate number of respondents.

Table 8. Response on land adequacy for livestock grazing by village in the study area (%)

Land adequate for grazing	Ng'iresi (n=15)	Seela (n=20)	Songoro (n=7)	Nkoanrua (n=22)	Timbolo (n=7)	Kisimiri (n=13)	Sambasha (n=20)	Shiboro (n=20)	All (n=124)
Yes	33.3(5)	5(1)	0(0)	9.1(2)	0(0)	7.7(1)	0(0)	0(0)	7.3
No	66.7(10)	95(19)	100(7)	90.9(20)	100(7)	92.3(12)	100(20)	100(20)	92.7
Total	100	100	100	100	100	100	100	100.0	100

Figures in parenthesis indicate number of respondents.

Among the 124 respondents interviewed, on average, 50.0% indicated that the land was enough from the time of inception because families were small, and became inadequate as household increased in size, due to population increase. However, 41.9% responded that the land was already small from the time of acquisition. The study further indicated that 4.2% of the respondents felt that they had not lived in the land they occupy long enough to give their observations. The adequacy of land from time of acquisition is presented in Figure 3.

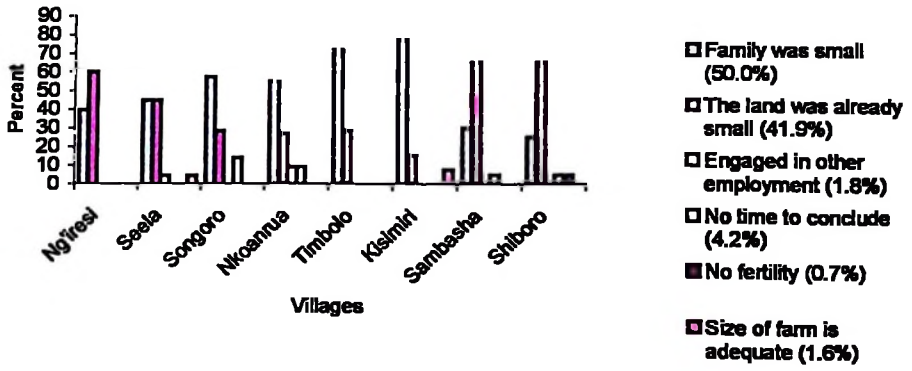

Figure 3: Adequacy of land from time of acquisition in the study villages

As already indicated in this section that farmland is not enough, and among the 124 respondents interviewed, 26.5% indicated to have opted for petty business as an alternative, 22.8% have adopted intercropping in their farms, 19.2% go for both daily basis and permanent employment in the formal sector, and 20.7% struggle to acquire plots from clear cut stands in the forest plantation as indicated in Figure 4. Only 7.9% responded to have bought land in lowland areas.

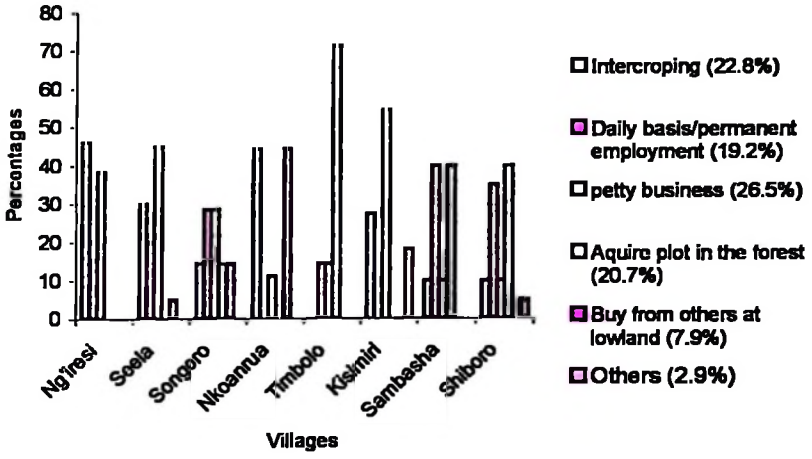

Figure 4: Alternative means for addressing inadequacy of land in the study area

4.3.3 Livestock ownership

Estimated livestock carrying capacity for Arumeru district is 0.2 LU per ha. This reflects a case of overstocking and consequently an incentive for grazing in Mount Meru forest reserves. Among the 124 respondents interviewed, 99.2% own livestock, whereas only 0.8% do not own any. The responses for livestock ownership are presented in Table 9. The type of livestock kept include among others, cattle goats sheep and donkeys, with an average of 11 animals per household. The study revealed that in the villages in the southeastern slopes of Mount Meru, which is inhabited by the Wameru people, the

farmers have adopted keeping of improved cattle breeds, while in the western part which is normally inhabited by the Waarusha people, indigenous cattle breeds dominates. It was noted that the amount of goats kept by the Waarusha is far higher compared to the area inhabited by the Wameru.

Table 9: Livestock ownership by villages in the study areas

Do you own livestock	Ng'iresi (n=15)	Seela (n=20)	Songoro (n=7)	Nkoanrua (n=22)	Timbolo (n=7)	Kisimiri (n=13)	Sambasha (n=20)	Shiboro (n=20)	All (n=124)
Yes	100(15)	95(19)	100(7)	100(22)	100(7)	100(13)	100(20)	100(20)	99.2
No	0(0)	5(1)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0.8
Total	100	100	100	100	100	100	100	100	100

Figures in parenthesis indicate number of respondents, not in parenthesis denote percent

4.3.3.1 Grazing of livestock

Livestock rising in Arumeru district is mainly based on free-range system of indigenous breeds of cattle goats, sheep and donkeys. Due to shrinkage in size of communal lands, which were used for grazing, the trend has changed to grazing in private lands. Private grazing lands in the Mount Meru areas are on small plots around the homesteads. Only few people own such plots and the plots are generally small in area, only about 0.2 ha. Consequently, supplementary feeding is necessary. This is done through collection of fodder from the forest and crop residues. Grazing is not allowed in most of the farms because household land is reserved for crop production leaving animals with no option but to go to forest reserves.

The study reveal that with improved livestock (cattle) some farmers in the area have adopted zero grazing especially for dairy cows. With this system, fodder is collected

from homegardens where fodder grasses are intermixed with banana, maize, beans and other crops in a spatial pattern. Fodder is also collected from the forest.

The study shows that of the 124 respondents interviewed, 33% indicated that they feed their livestock from their own fields and other sources including mineral concentrates, while 19.0% feed livestock from agricultural fields. Only 18.0% responded that they feed livestock from own fields, as well as buying from others farmers, also use fodder/grass collected from the forest as presented in figure 5.

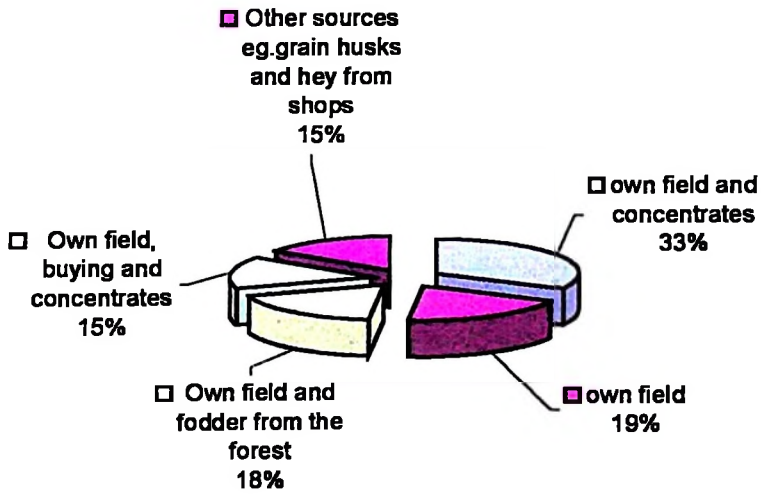

Figure 5. Livestock feeding methods in the study area

4.3.4 Forest reserves

In general, the Government and its institutions undertake significant forestry activities around Mount Meru area. The larger coverage includes Mount Meru Catchment forests and Meru Forest Plantations. According to Semu *et al* (1992), forest reserves and woodlots together cover about 15% of the total area of Arumeru district. Trees are also planted around homesteads and are used for various purposes including shade, lumber,

fuelwood production, and other purposes including ornamental. The common tree species are *Cordia abyssinica, Grevillea robusta, Croton* spp., *Eucalyptus* spp., *Rauvolfia caffra* and some fruit tree species such as *Persea americana* and *Prunus* spp.

The people bordering forest plantation are privileged to practice agroforestry in the plantation, the practice popularly known as taungya farming. The system involves allocation of about 0.2 ha in clear-felled areas to farmers through their village governments, which they use to grow annual crops such as potatoes, maize, beans and peas for some years before trees. The farmers continue with their crop production even after the trees have been planted until canopy closes when they are allocated to do the same in another taungya area. In doing so the farmers benefit (improve food production) while in turn have tended tree crop by weeding and first pruning. On the other hand forests provide a varied number of products to neighbouring communities such as fuelwood construction poles, fodder and other non-timber forest products including employment to undertake various silvicultural operations e.g. planting pruning and thinning.

Among the124 respondents interviewed during this study, 49% indicated that there is a forest plantation close to the villages, 25.9% indicated presence of indigenous forest, while 25% indicated that there are both indigenous and plantation forest bordering their villages. However, 90.7% indicated that forests are owned by central government.

It was interesting to find out that out of 124 respondents, 72.2% felt that the beneficiaries of the forest reserves were both villagers and government. About 16.7% responded that only government benefits from the forest. The way villagers benefit from the forest is indicated by the uses of the forest whereby among 124 respondents,

32.4%indicated to benefit from firewood. About 32.4% of the respondents showed to have access to the forest while 28.4% had access to the forest by obtaining permission. About 26.9% benefited from a combination of firewood, plots for taungya farming and fodder. Only 8.8% responded to access the forest after payment of a token fee of about TAS 1000 per year to access the forest for collection of firewood Responses from individual villages on forest use are presented in Table 10.

Table 10: Forest use by villages in the study area (%)

Forest use	Ng'iresi (n=20)	Seela (n=20)	Songoro (n=7)	Nkoanrua (n=22)	Timbolo (n=7)	Kisimiri (13)	Sambasha (20)	Shiboro (n=20)	All (n=124)
Firewood	73.3(16)	25(5)	0(0)	66.7(20)	0(0)	38.5(5)	25(5)	25(5)	32.4
Poles	0(0)	0(0)	0(0)	33.3(2)	0(0)	0(0)	0(0)	0(0)	1.9
Plots	0(0)	0(0)	14.3(1)	0(0)	0(0)	0(0)	0(0)	0(0)	0.9
Firewood& medicine	20(3)	5(1)	0(0)	0(0)	0(0)	7.7(1)	0(0)	0(0)	4.9
Firewood& fodder	6.7(1)	10(2)	0(0)	0(0)	0(0)	53.8(7)	10(2)	5(1)	12.0
Firewood& plots	0(0)	35(7)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	6.5
Firewood. Medicine & fodder	0(0)	10(2)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	1.9
Firewood plots & fodder	0(0)	15(3)	85.7(6)	0(0)	28.6(2)	0(0)	40(8)	50(10)	26.9
Firewood. plots. Fodder and poles	0(0)	0(0)	0(0)	0(0)	71.4(5)	0(0)	20(4)	15(3)	11.1
Firewood &poles	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	5(1)	5(1)	1.9
Total	100	100	100	100	100	100	100	100	100

Figures in parenthesis indicate number of respondents.

4.3.5 Wildlife reserve

Among 124 respondents, only 30.6% from Songoro and Kisimiri villages indicated that the villages border wildlife reserve, while 69.4% do not. On the other hand, 100% indicated that a wildlife reserve has no use to them. About 55% responded that the beneficiary of wildlife resource is the government, and 45.0% indicated that the beneficiaries are the government and game staff, as presented in Table 11. They concluded by saying that entering the wildlife reserve is totally prohibited.

Table 11. Wildlife reserve beneficiaries by village in the study area (%)

Wildlife reserve Beneficiaries	Songoro (n=7)	Kisimiri (n=13)	All (n=20)
Government	57.1(4)	53.8(7)	55
Government and game staff	42.9(3)	46.2(6)	45
Total	100.0	100.0	100

Figures in parenthesis indicate number of respondents.

4.4 Land use conflicts and their causes

4.4.1 Existing land use conflicts

In Mount Meru area the interface between farming, livestock keeping, forest reserves and wildlife is based on how land partitioning is done between crop and livestock production. This can be a point of departure when discussing the extent of resource use conflicts in the reserves. The two main tribes found in the area, namely Waarusha and Wameru have distinctive features that lead to intensive use of land.

The Waarusha who are part of pastoral Maasai ethnic group, had in recent years adapted to a more settled pattern of life and became agropastoralists. In doing so, raising of crops has become part of their way of life along with their herds of livestock. The shifting from nomadic pastoralists to agropastoralists however did not seem to consider the proportionate land requirement of both livestock and crop raising. The Wameru remained to be agriculturalists with large emphasis on crop production, although they have also developed livestock production.

Increased human population pressure coupled with general land shortage in the area has resulted in the shrinkage in land area for both crop and livestock production. The

cumulative effect of this situation has been large scale of encroachment in the forest reserves for cultivation and intensive grazing. Consequently, access without prior permission has resulted into conflict between villagers and the staff managing the reserves, when the offenders are forceful evicted and/or apprehended.

Among the 124 respondents interviewed 32.0% indicated that there are conflicts emanating from grazing illegally in the forest, 18.0% emanating from farm boundaries, and 16.0% indicated conflict resulting on encroachment into forest and wildlife reserves. 14.0% indicated conflicts emanating from illegal tree cutting, while 11.0% and 9.0% indicated other sources of conflicts e.g. Poaching and illegal fuelwood collection respectively. Responses indicating existing sources of conflicts are presented in Figure 7.

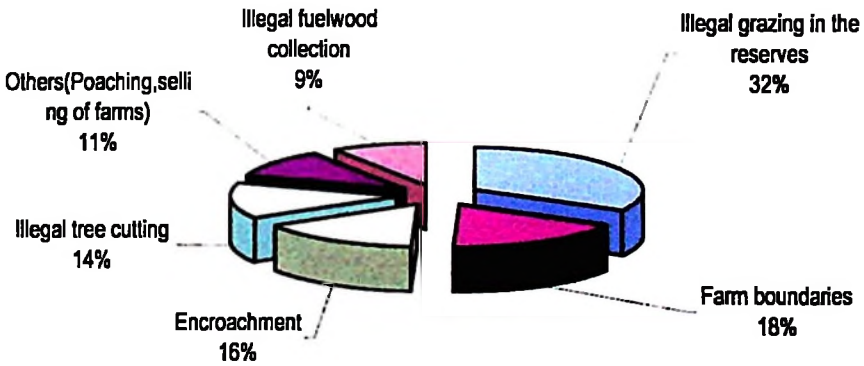

Figure 6: Existing sources of conflict

4.4.1.1 Illegal grazing of livestock in the forest and wildlife reserves

Among the124 respondents interviewed in the study area, 99.2% indicated that they keep livestock (Table 12), while at the same time 92.7% indicated that land is not adequate for grazing the livestock (Section 4.3.2).

Table 12: Livestock keeping by percent in the study villages (%).

Do you keep livestock	Ng'iresi (n=15)	Seela (n=20)	Songoro (n=7)	Nkoanrua (n=22)	Timbol o(n=7)	Kisimiri (n=13)	Sambasha (n=20)	Shiboro (n=20)	All (n=124
Yes	100(15)	95(19)	100(7)	100(22)	100(7)	100(13)	100(17)	100(18)	99.2
No	0(0)	5(1)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0.8
Total	100	100	100	100	100	100	100	100	100

Figures in parenthesis indicate number of respondents.

In light of the indicated serious land shortage it is obvious that the practice of free grazing lead to illegal grazing in the reserves, as a safety valve. The reports from Mount Meru catchment and Meru Forest Plantations for fiscal years 2000-2002 indicated that about 2917 heads of livestock were caught grazing illegally in the forest reserve. Table 13 present numbers of livestock caught in the forest reserves.

Table 13: Illegal livestock grazing in Mount Meru Forest Reserves from 2000 to 2002.

Year	No. of heads
2000	1004
2001	803
2002	1110
Total	2917

Source: Meru Forest Plantations and Arusha Catchment Forests (2002)

The apprehended culprits were fined between TAS 20,000 and 100,000 per animal and a total amount of about TAS 6,091,548 were collected as fines. The whole exercise brings misunderstanding and hatred between the villagers and reserve managers. This problem is most dominant in the western parts of the district, which is predominantly inhabited by the Waarusha people. The problem is worse in western part, which is inhabited by the Waarusha people, who like most Maasai believe that big herds of cattle are a prestige and sign of wealth and kind of saving. In the contrary, in the eastern part the problem is a bit less due to the fact that the Wameru people have adopted keeping improved breed of cattle under zero grazing.

The Waarusha who are agropastoralists some of them keep livestock in rangelands in the lowland and the problem escalate in the dry season when livestock are brought in the mountainous areas to graze.

4.4.1.2 Factors influencing illegal livestock grazing in the reserves

Illegal livestock grazing in the reserves has been one of major sources of land use conflict around Mount Meru area. Efforts to address this problem need to consider factors that directly or indirectly influence illegal grazing. Factors influencing illegal grazing of livestock in the reserves were investigated using a multiple linear regression model. The factors/variables involved included: Place where livestock are grazed, tribe, total agricultural land owned and number of livestock was regressed against amount of livestock grazing illegally in the reserves (Appendix 5). Variables included in the model were checked for Pearson Correlation Coefficient and found not to suffer from multicollinearity (Appendix 4). None of the variables had a correlation greater than 0.8 with any other variable. Table 14 shows that grazing area had a significant influence on the number of illegal grazing livestock ($p=0.001$). The beta coefficient was negative

implying that if grazing area increases, number of illegal grazing livestock in the reserves decreases. The number of livestock owned and number of illegal grazing livestock in the reserves show significance at (p=0.01). The beta coefficient was positive indicating that number of illegal grazing livestock increases with increasing number of livestock owned by farmers in the study area. The multiple Coefficient of Determination, R^2 obtained was 0.49. This means that the above independent variables accounted for 49.0% of variation in the dependent variable. The remaining 51% account for variables, which might have high value but likely have low value of the other. The independent variables, which had the greatest positive weights, were number of livestock owned (0.24), place of grazing (- .13) and lastly the tribe (- .63).

Table 14: Regression analysis results for factors contributing to illegal grazing of livestock in the reserves around Mount Meru area

X_i	Y_i		R^2= 0.497	
	B	Beta	t	Sign-t
Place of grazing	-5.43E-02	-.132	-1.962	0.001* *
Livestock				
Tribe	-1.653	-.636	-9.541	0.00**
Number of livestock	.123	.248	3.453	0.001**
Owned				

X_i= Independent variable

Y_i= Livestock grazing illegally in the forest

R^2= Coefficient of determination

**= Significant at 0.01 level

ns= Not significant at 0.01 level

4.4.1.3 Illegal tree cutting in the forest reserves

Illegal tree cutting has also been among the areas bringing conflicts. About 13.8% of respondents indicated that there are conflicts associated with illegal tree cutting, among several others. With increased population in the study area coupled with decreasing land area per household, there is increase in wood demand for different uses such as fuelwood, for both household consumption and sale to Arusha municipality building poles especially from Cedar (*Juniperus procera*) and Loliondo (*Olea capensis*). So to say, this has been adopted by people living close to the forest as one of income generating activities.

There is sometimes illegal pit sawing for lumber in some areas of the forest. According to Massao (1993), it was estimated that over 500 hectares of forest on the slopes of Mount Meru were cut or burnt in 1990 indicating the severity of forest depletion. Interview done to forest managers for Mount Meru Forest Plantations showed that a total of 30 hectares of trees valued TAS 7.6 million, were cut illegally for the year 2000-2002, 2955 poles confiscated and 34 culprits apprehended.

4.4.1.4 Encroachment in the forest/wildlife reserves

In communities living around Mount Meru, small farm sizes are not normally compensated for by increased productivity per unit area of land, but rather by expansion into marginal lands and into forest reserves, thus increased exploitation of reserve resources through encroachment. In the study area, among 124 respondents interviewed, 79.5% reported aware of encroachment in the forest reserves and indicated that one of reasons for encroachment is land scarcity (Table 15). Between fiscal years 2000-2002 about 610 ha of forest area were encroached to open up farms for agriculture.

Table 15: Reasons for encroachment of the forest by village in the study area (%)

Reason for encroachment	Seela (n=20)	Songoro (n=7)	Timbolo (n=7)	Kisimiri (n=13)	Sambasha (n=20)	Shiboro (n=20)	All (n=124)
Boundary not known	5(1)	16.7(1)	0(0)	0(0)	5.3(1)	5.3(1)	6.0
Land scarcity	60(12)	83.3(6)	85.7(6)	75(10)	89.5(17)	89.5(18)	79.5
Boundary and land scarcity	15(3)	0(0)	14.3(1)	8.3(1)	0(0)		6.4
Others	20(4)	0(0)	0(0)	16.7(2)	5.3(1)	5.3(1)	8.1
Total	100	100	100	100	100	100	100

Figures in parenthesis indicate number of respondents.

However, it was indicated by forest reserve management that reasons for encroachment is not only due to shortage of land for crop production, but also for establishing cattle enclosures in the deep areas of the catchment forest. It was indicated by small percent 6.0% of the respondents that encroachment is caused by the fact that boundaries between villages and reserves are not known. This was testified by Arusha National Park Ecologist who indicated that there exist no buffer zone between the park and the villages to make a distinct demarcation between the two. This also creates loopholes for unauthorized entering of the park. Also there are no fire lines between forest reserve and the villages. This was noted in the Usa River block. In Meru catchment and plantation forests alone between fiscal years 2000-2002 about 610 hectares of forest area was encroached to open area for agricultural production. Figures for area encroached are presented in Table 16.

Table 16. Area encroached in the forest reserve 2000-2002

Year	2000	2001	2002
Area (ha)			
Catchment		500	40
Plantation	70		
Total	70	500	40

Source: Meru Forest Plantations and Arusha Catchment Forests (2002)

4.4.1.5 Conflict over farm boundaries

Among the 124 respondents interviewed, 17.4% indicated that there are conflicts emanating from farm boundaries (Figure 6). In order to sustain the production of food, fodder and other goods for the household for the whole year, expansion on land area is inevitable. It was observed that progressive fragmentation of land explain decline in farm sizes (Section 4.3.2). With the prevailing land shortage there is no possibility of expansion hence conflicts on farm boundaries between families is abundant, when one household shifts farm boundary in order to increase land area.

4.4.1.6 Conflict between reserve owners

Like some of wildlife conservation areas, Arusha National Park was established from the area delineated from a forest reserve, (section 1.1.2.2). As a result in some areas as indicated by forest management, there is a tendency of wild animals to cross to the forest plantation, consequently grazing on young stands, hence destroying young seedlings. According to wildlife conservation laws, killing such animals is forbidden, therefore there is always a conflict between forest and wildlife management on how to deal with such destructive agents. Trenches and electric fences to hinder entrance of animals to the forest plantation were among the attempts done on trial basis but proved

ineffective. Recently the plantation management has changed tree species in stands bordering National Park, but results are not yet realized as to whether the approach can discourage animals from entering the forest plantation.

The College of African Wildlife Management (CAWM) has been in conflict with Catchment forest officials over an area between Catchment Forest and National Park, which the college uses for practical training. It is not clear who is responsible to manage that area. Both parts claim that the area is under their charge therefore bringing a management conflict.

4.5 Local strategies for conflict management

In the farming communities around Mount Meru forest reserve, crop production has received a higher priority than livestock keeping. Larger areas have been allocated for crop production than livestock grazing (Section 4.3.2). About 32.0% of respondents indicated existing conflicts to be due to illegal grazing in the reserves, followed by farm boundaries 18%, encroachment in the forest/wildlife 16%, illegal tree cutting 14%, others (poaching, selling of farms etc) 11% and lastly illegal fuelwood collection 9%. as presented in Figure 6.

The study results showed that strategies in response to the emerging conflicts include among others;

- Use of elders- Elders popularly known as 'Wachili' are used to resolve conflicts on farm boundaries through dialogue and mediations. Most of the conflicts emerging from farm boundaries are discussed in elders' meeting and if need arises the deliberations are taken to village governments. About 30.0% of the respondents argue that these people have been living in these areas for years and they are aware of boundaries both within their clans as well as reserves. Identification of boundaries

should be undertaken in collaboration between the community leaders and reserve administration.

- ❖ Establishment of Village Environment Committee (VEC)- About 38.5% of the respondents interviewed indicated that creation of VEC has enabled the villages to have forum where environmental matters are handled. This has been a bridge between resource management and the neighboring communities. This is a new approach, which has been initiated by both forest and Arusha National Park management in order to facilitate joint resource management with villagers living close to the resource. VEC works hand in hand with forest and park officials to organize among others, patrols, demarcation of boundaries and organize tree-planting activities. Using by-laws village governments are able to impose fines to culprits. Half of the money from fines remains for public activities in the respective villages and the reserve management takes the other half.
- ❖ Creation of awareness- Foresters and park officials have initiated efforts to create awareness to people on resource conservation. This has been done through village governments, with the help of experts to provide conservation education to the villagers. About 23.0% of the respondents interviewed indicated that extension workers in the wards provide among other things conservation education to the people. Extension officers are also members of VEC. Conservation education is also advocated during Village Annual General Meeting.
- ❖ Non Governmental Organizations (NGOs)- Several NGOs are working in Arumeru district trying to promote community development in different sectors of economy and nature conservation. The most recognized NGO working in Arumeru is Soil Conservation and Agroforestry Programme Arusha (SCAPA). In recent years SCAPA was involved with the main objective of increasing food security in its project area, through soil conservation activities at farm level, in some villages in the

high altitudes of the district. The conservation activities are implemented through multidisciplinary approach, involving animal husbandry, forestry and crop farming.

- Animal husbandry; improvement of livestock production by introducing improved cattle breed which are stall fed using grass and shrubs grown around the farms to compliment crop residues.
- Forestry; to encourage tree planting around farms and homesteads and educate the communities on the best use of tree resources e.g. use of improved stoves to reduce consumption of wood fuel.

Crop farming; to educate people the best farm management practices and use of proper crop seeds to match the environment in order to improve crop harvest.

4.6 Institutional measures for management of conflicts over resource use

4.6.1 An overview

Conflicts over the appropriation, management and use of natural resources such as forests and wildlife can pose significant constraints to sustainable management. Often times there are long standing conflicts between government, their agencies, the private sector and local communities as well as among and within communities over resource use and control.

Mount Meru area like many other parts of the world, in which the biophysical environment and socio-cultural systems are changing rapidly, conflicts involving gazetted areas are inevitable. Lewis (1996) argued however that conflict is not necessarily bad. Conflict can present the productive interaction of competing interests and values, an ever-present function in a dynamic society. Conflicts that are properly addressed can be opportunities for problem to be identified and solved, and progress achieved. Many conflicts however, can be counterproductive and destructive leading to

detrimental results and hostile relationships. Land use conflicts at Mount Meru area are counterproductive, therefore staff in gazetted areas face the challenge of trying to respond to conflicts so that unproductive consequences can be avoided while human well-being and natural environment is protected.

4.6.2 Joint Forest Management

Joint Forest Management (JFM) is where more than one group of persons or stakeholders is managing the forest (Wily, 1998). Usually there are two partners, and usually they are the state (government or another agency designated by the state), and the local community (or a group, committee or agency designated by it). In JFM the tasks of management are divided among the two. More often than not, the partnership is unequal. The state has all the power, and the community does most of the work. The work itself is usually made up of two main tasks: to protect the forest from damaging use, and to supervise the use of the forest. The more genuine model of JFM is where partners do not operate separately but agree to work together in a Joint Committee. In this way, overtime, powers, responsibilities and commitments tend to be shared. Clear example in Tanzania where this practice has been successful is the Duru-Haitemba forest in Babati and Mgori in Singida.

In an interview with Arusha catchment forest staff, it was revealed that the 'police' type of forest management is no longer desired due to the fact that the forest does not belong to a forester but several stakeholders. In line with National Forest Policy of 1998, Joint Forest Management has been advocated (URT, 1998). In doing so future Management Plan has to be prepared stipulating among others, how to manage the forest jointly with stakeholders. The plan will also look into consolidation of forest boundaries by resurveying and creation of awareness of such boundaries to the villagers. Management

Plan is a tool that set the basic management and development philosophy of the reserve. JFM further look into income generating activities that can be adopted to benefit the local people around Mount Meru area. These include such activities like beekeeping, ecotourism, use of bamboo shoots as crafting materials, and promotion of use of non-wood forest products, which are abundant in the indigenous forest.

An interview with Meru Forest Plantation management revealed that after realizing that managing the forest using only laws has proved failure, in 1988 forest administration started participatory forest management. The approach here has been signing a Forest Management Agreement (Appendix 6), between Meru Forest Plantations and villages bordering the forest, requesting participation in such areas like forest patrols, forest fire fighting, curbing illegal tree cutting and grazing in the forest.

Benefits obtained by villagers from such contracts include free firewood collection, building poles and fodder from the forest after producing a letter from village governments, logs after getting permission from the Director of Forestry and Beekeeping for timber to help in construction of schools/dispensaries in respective villages. Furthermore the village governments under such contracts benefits in terms of cash, about TAS 50,000 – 80,000 per month from plantations revenue collection except during planting and fire fighting months.

4.6.3 Community based conservation

Conceptually, the community-based conservation (CBC) approach has at least part of its origin in the new development concepts. The new concepts emphasize such matters as public involvement, co-operative management, power sharing, devolution, empowerment, and participatory democracy (Songorwa, 2001). Participation of local communities in the management of wildlife is part of wider advocacy for popular

participation in development. In Mount Meru area conservation strategy in order to avoid resource conflicts, the Arusha National Park has embarked on community based conservation services to go in line with the concept of community based conservation of wildlife resource in the area, as follows:

- To create a good relationship between park management and the neighbouring communities;
- To facilitate planned sharing of wildlife benefits. In doing so the program helps to support projects initiated by the neighbouring communities;
- To provide conservation education and extension services to communities close to the park.

Practically, the National Park observes total protection. Conflicts are silent but are pivoted in such problems like encroachment, illegal entering and grazing in some parts of the park.

4.6.4 Migration to other district with abundant land

In 2001, District Administration visited Handeni, Ludewa, Njombe and Kiteto districts to request for land to accommodate the continuous growing landless populace in Arumeru (Verbal communication with District Lands Officer). The request was accepted but the problem with local people remained to be the distance from area of domicile to particularly Ludewa and Njombe districts which are too far from Arusha, and also funds to do ground work for people to be able to get established in such new areas.

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

From the results and discussion in chapter four, it is concluded that the alternative hypothesis has been accepted that land use conflicts between agropastoralists/farmers and forest/wildlife reserves in Mount Meru area can be considered to be due to pressure of land. The following types of conflicts were identified;

- Limited access (the right to enter reserves)-It is neither legal to graze livestock in the reserves nor allowed to convert the reserve land to agricultural use (encroachment).
- Limited withdrawal (the right to obtain products from reservcs)-Collection of firewood, withies, medicine and mushroom is allowed in the forest plantation but not in the catchment or national park. It is illegal to cut wood for commercial purposes unless specified by the authorized forest staff.
- Contested boundaries amongst farmers and between villagers and reserves managers.

The causative factors of conflicts are a multi-facet scenario of the following;

Illegal grazing of livestock in the reserves – Unlike in the lowlands where livestock graze freely in the rangeland, around Mount Meru area grazing land is quite limited. Therefore land is held either under individual basis of small areas (0.8 ha.) or under forest and game reserves. It has become clear that pastureland is inadequate and hence people tend to graze their livestock in the government reserves. In acute shortage of grasses livestock keepers dare even to create cattle enclosures inside the catchment forest. In apprehending the culprits the staff/management of the reserves have been in continuous hatred with local people that consequently lead to conflicts.

Encroachment – Land scarcity has been a big problem in the area, as a result expansion of land to increase area for crop and livestock production has been practically impossible. The local peoples' only solution to address this problem has been to encroach the reserves by shifting the boundaries between villages and some parts of the reserves in order to increase farm areas. For a period of years 2000-2002 about 610 ha of forest were encroached to give room for crop production.

Population pressure –The increase in both human and livestock population to the fixed land area has led to a continuous land fragmentation among heirs.

Competition for land – Crop production has been allocated larger areas as compared to livestock production (Section 4.3.2). While the Wameru are traditionally peasant farmers the Waarusha who were traditionally pastoralists adopted the practice of agropastoralism while trying to maintain their large number of livestock. This scenario has created an acute competition for land in order to maintain the two systems of production. The situation has been aggravated by the fact that a reasonable part of the fertile Mount Meru area is comprised of forest and wildlife reserves (Sections 4.3.2 and 4.3.4), hence there is no room for expansion to increase land for crop and livestock production. This has led to encroachment into the forest and wildlife reserve.

5.2 Recommendations

From the preceding conclusions, the following recommendations are made:

1. In spite of relatively big numbers of cattle kept by the Waarusha people (Section 4.3.3), the study has shown that the contribution in income from livestock is less compare to the Wameru in the eastern part. It is therefore recommended that destocking the indigenous breed to be replaced by few improved cattle breed under

zero grazing will reduce if not eradicate completely the problem of illegal grazing in the reserves, raise income through trade in livestock products hence increasing household income and also improve the general well-being of the people. In totality, destocking will improve living standards of people around Mount Meru area. Extra assistance is required to sustain zero grazing, such as fodder, medicine, transport facilities for feed collection, credit to invest in new cattle breeds, and storage facilities of excess feeds. Moreover, government policies in destocking should be accompanied by alternative packages, e.g. low interest loans for starting up dairy cattle farming as well as attractive markets for dairy products.

2. Given the small average farm size in the study area, the farm productivity can be increased by improving homegardens (tree-crop-animal combination). Farmers should try to optimise their gardens by planting as many crops as they can in limited space available and in physical constraints of the home environment. Improved seeds and inorganic fertilizers can also be used to improve farm productivity.

3. Increase in population of both human and livestock to a fixed area, has created land scarcity in the highland areas of Mount Meru. In order to be more productive and earn increased income to suffice needs for food and other household requirements, landless and people with inadequate farmland should migrate to other spacious areas especially to those districts already requested for, by the district administration i.e. Handeni, Kiteto, Ludewa and Njombe. Government, regional and district administration should make efforts to mobilize and educate people on this issue. Furthermore people who are willing to move to other districts should be given support by government as a motivation so that they can establish new settlements in the earmarked villages in the

respective districts. Rural people should also be educated in family planning approaches. This is one strategy of solving the problem of over population.

4. Environmental education should be promoted so as to raise people's awareness to forest and wildlife values and attitudes towards conservation of reserves. Rural communities should be encouraged to participate actively in management of natural resources. Strengthening extension education and creation of active Village Environment Committee (VEC) can do this. Environmental education should be incorporated in primary and secondary school syllabi. Furthermore, primary and secondary education should be strengthened. Through education it is expected that management of household resources will be improved hence reducing pressure on natural resources.

5. Both forest and wildlife management plans should along with national conservation goals consider areas to make way forward towards fighting against poverty. The plans should incorporate income-generating activities, which are to be carried out by the neighbouring communities in order to increase household incomes through use of the reserves. Activities such as beekeeping, crafting, mushroom growing, ecotourism and tour guide groups should be promoted by government and its institutions that own and manage the resources around Mount Meru area. NGOs should also be encouraged to address the same.

6. Joint Forest Management (JFM) – this can be used as a tool to alleviate resource use conflicts. In this approach, neighbouring communities are regarded as one part of stakeholders working together with state agency in managing the reserves. Management by several stakeholders replaces the 'police' type of management by the

state agency. The tool to facilitate this can be Integrated Management Plans outlining in detail the action of various stakeholders. Also they should be developed in cooperation with communities, local government and related resource management agencies. Moreover, they should stipulate how to manage the resources, what can be offered to stakeholders, amount and at what time. The plans should be prepared based on participatory processes that can take into consideration the local and national interests. It is particularly important to emphasize here that communication and transparency with all stakeholders is the bedrock of this approach.

7. Redistribution of land once under big farms – Almost all the land left in Arumeru district is primarily privately owned, consequently the areas under household are continuously decreasing because of being divided between heirs. With population increase, time will reach when some families will become landless. District authorities should continue with efforts to acquire the underdeveloped areas once occupied by European settlers and distribute them to the landless people.

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APPENDICES

Appendix 1: Sample questionnaire for household data.

VILLAGE AND FARMER CHARACTERISTICS

1. Name of village.....Date.....
2. Name of respondent.....Age.....
3. Level of education?
   a) No formal education.....
   b) Adult education.....
   c) Primary education.....
   d) Secondary education.....
   e) Others (Specify).....
4. Head of household. Male.....Female.....
5. Household composition.
   Total number in the household.....
   a) Males below 18 years.....
   b) Males above 18 years.....
   c) Females below 18 years.....
   d) Females above 18 years.....
6. Ethnicity.....
7. Main occupation.....
8. Length of residence in the village.....

LAND USE AND OWNERSHIP

9. Total agricultural land owned.....
10. How did you acquire the land you own?
    a) Bought.....
    b) Rented.....
    c) Inherited.....
    d) Allocated by government.....
    e) Other (Specify).....
11. Location of the farm in the landscape.
    a) Around homestead.....

b) Other.....

12. How do you use your land.....

a) For grazing.....

b) For crop production.....

c) Others.....

13. Is your land adequate for;

a) Crop production.....

b) Grazing.....

14. If not enough how then do you manage?.....

15. What do you think should be done to increase productivity?.....

16. For how long have you been using this land.....

17. Was this land enough by then.....

Reasons.....

.....

18. What institutional rights do you have over your land?

a) Title deed.....

b) Customary rights.....

c) Village protection.....

d) No rights.....

19. How does the land rights influence your investment decisions with regard to resource conservation?

a) Expansion of your agricultural/grazing land.....

b) Improving agricultural/grazing land.....

c) Diversification of enterprises.....

20 What type of crop do you grow?

a) Cash crops.....

b) Food crops.....

c) Others.....

21. Who is responsible for farm works?

a) Men.....

b) Women.....

c) Children.....

d) Both.....

22. What measures do you take to improve productivity?
    a) Use of fertilizers.....
    b) Use of improved seeds.....
23. Do you face problems with regard to agricultural production?
    Yes.....No.:.....
24. If yes what are they.....
25. Do you keep livestock?
    Yes.....No.....
26. If yes what type and number.
    Cattle .....
    Goats .....
    Sheep .....
    Donkey .....
    Poultry .....
    Others .....
27. Where do you get feed for the livestock?
    a) Own field.....
    b) Buy from others.....
    c) Do free grazing.....Where.....
    d) Others.....
28. Who takes care of livestock.....
29. Who decides on general grazing matters in this village?
    a) Village leaders.....b) Farmer groups.....
    b) Others (Specify).....
30. What is your average family income TSh.
    a) Less than 200 000.....
    b) 200 000 – 400 000.....
    c) 400 000 – 600 000.....
    d) 600 000 – 800 000.....
    e) Above 800 000.....
31. Which activity give more income?
    a) Crop production.....
    b) Livestock production.....
    c) Others (Specify).....

32. Are there any restrictions on stocking rates in this village?
33. If yes in 32, who imposes the restrictions?.....
34. Do you have any institutions for regulating resource use in this village?
35. If yes what are these institutions?
    a) Customary.....
    b) Farmer groups.....
    c) Formal institutions set by government.....
    d) Mixed intitutions.....

FOREST AND WILDLIFE UTILIZATION

36. Do you have any forest in this village?
    What type?.....
37. If yes who own the forest?
    a) Central government.....
    b) Local government.....
    c) Village.....
    d) Others (Specify).....
38. Is there any game reserve close to the village?
39. If yes who own the game reserve?
    .....
    .....
    .....
40. What are the uses forests in/around the village?
    i).....
    ii).....
    iii).....
    iv).....
    v).....
41. What are the uses of wildlife resources?
    i).....
    ii).....
    iii).....

iv).....

v).....

42. Do you get access to forests/game reserves?

a) Free.....

b) Permission.....

c) Fee.....

43. Who are beneficiaries of forests/ game reserves?

a) Government.....

b) Villagers.....

c) Forest/game staff.....

d) Others.....

44. Do you know any case of encroachment in the forest/ game reserves?

45. If yes mention reasons for encroachment.

a) Boundary not known.....

b) Land scarcity.....

c) Others.....

46. Have you noted any conflict in;

a) Use of land for farms.....

b) Use of land for grazing.....

c) Use of forests.....

d) Use of game reserves.....

e) Others (Specify).....

Appendix 2: Questionnaire to village key informants

1. Name of the village.....

2. Human population.....Males.....Female.....

a) Active population (Above 15 yrs).....

b) Children (Below 15 yrs).....

c) Aged people (Above 60 yrs).....

3. Number of households.....

4. Average size of households.....

5. Female headed households.....

6. Male headed households.....

7. Social services in the village.

a) Schools.....

b) Healthcare units.....

c) Markets.....

d) Shops.....

e) Co-operative societies.....

f) Piped water.....

g) All weather roads.....

8. Main activities in the village.

a) Farming.....

b) Livestock keeping.....

c) Casual employment.....

d) Petty business.....

e) Others (Specify).....

9. Average farm size per household.....

10. What is the type of crop normally grown by farmers?

a) Food crop.....

b) Cash crop.....

c) Others (Specify).....

11. Livestock population owned in the village.....

a) Cattle.....

b) Goats.....

c) Sheep.....

d) Donkey.....

e) Pigs.....

f) Poultry.....

g) Others (Specify).....

12. What is the average stocking rate for 11 above.....

.....

.....

13. Land use pattern.

a) Total geographical area.....

b) Forest.....

c) Agricultural area.....

d) Grazing land.....

e) Game reserves.....

LAND AVAILABILITY

14. Is land enough for both crop and livestock production?

a) Crop production.....

b) Livestock production.....

15. Do have any forest in this village?

Ownership;

a) Central government.....

b) Village.....

c) Individuals.....

d) Others (Specify).....

16. Is there any game reserves close to this village?

17. What do the residence of this village benefit from 15 & 16 above?

.....

.....

.....

.....

.....

18. What are potential conflicts in land use;

a) Between sedentary farmers and agropastoralists.....

b) Between members in the household over ownership.....

c) Access to forest and game reserves.....

d) Others (Specify).....

19. What are the strategies in response to emerging resource conflicts.....

.....

.....

.....

.....

20. What are the institutional mechanisms for conflict resolution within and between user groups?

a) Negotiations.....

b) Mediations.....

c) Court proceedings.....

d) Joint management.....

c) Others (Specify).....

21. Does the existing institutional arrangement allow all groups of stakeholders to have an effective voice in decision making and rule enforcement?.....

22. If yes in 21, what are the arrangements.....

.....

.....

.....

23. If no in 21, what forum would be most useful.....

.....

.....

24. What are the incentives for ensuring compliance with resource use and regulations?

a) Resource use rights.....

b) Conservation values.....

c) Strong enforcement.....

d) Others (Specify).....

25. Which ethnic groups has the long-standing claims to the use of natural resources of this area.....

26. What factors are perceived as the main causes of ecological damage in this area?

a) Pastoral system.....

b) Inappropriate agricultural practices.....

c) Tenure insecurity.....

d) Lack of appropriate institutions to regulate resource use.....

.....

e) Weak enforcement of resource use regulations.....

f) Others.....

27. What incentives are in place to encourage;

a) Better use of land for crop production.....

c) Better livestock production.....

d) Wise use of forest and wildlife reserves.....

e) Human emmigration.....

Appendix 3: Checklist for Key Informants

Forest Officials:

- Foresters appraisal of the overall condition of the forest
- General management objectives
- Management problems and underlying causes
- Strategy to improve management
- Achievement and problems of the project
- Forestry legislation and rules
- Suggestions on community participation/involvement of local communities
- Recorded conflicts, causes and resolutions
- Suggestions to;
    - Curb illegal grazing
    - Curb encroachment
    - Curb illegal tree cutting

Natural resource officers:

- Role of Mount Meru Forest reserves
- Existing relationship with Meru forest reserves
- What role do you play in conflict resolution
    - Ethnic
    - Waarusha vs Reserves
    - Wameru vs Reserves
    - Different land uses
- What are your suggestion on the existing:
    - Land pressure
    - Livestock stocking
    - Improvement on farm productivity

Park Officials.

- Main activities
- Management objectives
- Management problems and underlying causes
- Management rules and regulations
- How and how frequent are local people are allowed int the park
- What products are allowed to local people and how sustainable is the exercice

- What are recorded conflicts and resolutions
- Wildlife legislation and rules

Village Leaders:

- Awareness to the importance of Meru Forest Plantation/Catchment
- Village strategies in conserving Meru Forest reserves
- Village tree planting activities
- Conflicts and resolution mechanisms
- Enforcement of rules and regulations
- Existing local institutions
- Socio economic factors constraining or favouring sustainable conservation of forest/wildlife reserves

Appendix 4. Correlation matrix

Correlations

		tribe	Main occupation	Length of residence in the village	Total agricultural land owned	where do you feed livestock	Noted conlict	number of illegal grazing livestock	number of livestock
tribe	Pearson Correlation	1.000	-.161	.052	.111	.159	.070	-.615**	.108
	Sig. (2-tailed)	.	.073	.567	.219	.082	.472	.000	.235
	N	124	124	124	124	120	109	124	124
Main occupation	Pearson Correlation	-.161	1.000	-.317**	-.044	.053	-.141	.112	.009
	Sig. (2-tailed)	.073	.	.000	.629	.568	.142	.215	.919
	N	124	124	124	124	120	109	124	124
Length of residence in the village	Pearson Correlation	.052	-.317**	1.000	.165	.120	.258**	.007	-.089
	Sig. (2-tailed)	.567	.000	.	.068	.191	.007	.937	.325
	N	124	124	124	124	120	109	124	124
Total agricultural land owned	Pearson Correlation	.111	-.044	.165	1.000	-.106	.320**	.166	.387**
	Sig. (2-tailed)	.219	.629	.068	.	.247	.001	.066	.000
	N	124	124	124	124	120	109	124	124
where do you feed livestock	Pearson Correlation	.159	.053	.120	-.106	1.000	-.146	-.293**	-.188*
	Sig. (2-tailed)	.082	.568	.191	.247	.	.134	.001	.040
	N	120	120	120	120	120	106	120	120
Noted conlict	Pearson Correlation	.070	-.141	.258**	.320**	-.146	1.000	.172	.288**
	Sig. (2-tailed)	.472	.142	.007	.001	.134	.	.073	.002
	N	109	109	109	109	106	109	109	109
number of illegal grazing livestock	Pearson Correlation	-.615**	.112	.007	.166	-.293**	.172	1.000	.246**
	Sig. (2-tailed)	.000	.215	.937	.066	.001	.073	.	.006
	N	124	124	124	124	120	109	124	124
number of livestock	Pearson Correlation	.108	.009	-.089	.387**	-.188*	.288**	.246**	1.000
	Sig. (2-tailed)	.235	.919	.325	.000	.040	.002	.006	.
	N	124	124	124	124	120	109	124	124

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Appendix 5: Regression results, factors contributing to illegal grazing of livestock in the reserves.

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	number of livestock, tribe, where do you feed livestock, Total agricultural land owned[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: number of illegal grazing livestock

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.717[a]	.514	.497	.9251

a. Predictors: (Constant), number of livestock, tribe, where do you feed livestock, Total agricultural land owned

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	104.087	4	26.022	30.407	.000[a]
	Residual	98.413	115	.856		
	Total	202.500	119			

a. Predictors: (Constant), number of livestock, tribe, where do you feed livest Total agricultural land owned

b. Dependent Variable: number of illegal grazing livestock

Appendix 5 (cont.)

Coefficients[a]

Mode		Unstandardized Coefficient		Standardized Coefficients	t	Sig.
		B	Std.	Beta		
1	(Constant	3.412	.338		10.10	.000
	where do you livestoc	-5.43E-	.028	-.132	-1.962	.001
	tribe	-1.653	.173	-.636	-9.541	.000
	Total land	.117	.070	.118	1.672	.097
	number of	.123	.036	.248	3.453	.001

a. Dependent Variable: number of illegal grazing

Appendix 6. Forest Management Agreement

Misitu Meru/Usa,
S.L.P. 1257
ARUSHA.

Kumb. Na OL/37/01/VOL. IV/126 30 06 2000

MWENYEKITI WA KIJIJI
KIJIJI CHA SAMBASHA

YAH: MAKUBALIANO YA KIJIJI KUSAIDIA KULINDA MSITU WA MERU/USA ENEO LA SAMBASHA

Rejea kichwa cha habari hapo juu, kwanza napenda kutoa shukrani kwa mikutano yote ambayo tumekwisha fanya na uongozi wa kijiji, wanachi kwa ujumla na hatimaye kuunda kamati ya mazingira ikiwa na wawakilishi kutoka kila kitongoji

Nia ya ofisi ilikuwa ni kuanzisha makubaliano kati ya ofisi yangu na kijiji ili kuweza kuufanya msitu wa Meru (Sambasha) maeneo yanayozungukwa na kijij chako kuhifadhi ipasavyo kwa kutumia juhudi za wanakijiji kupitia kamati yako ya mazingira na Serikali ya kijij.

Hatua tuliyofikia ni nzuri na kilichobaki na utekelezaji Ni vema ofisi yako ikatambua kuwa mradi wa misitu unategemea mambo yafuatayo kutoka kwenye ofisi ya kijiji -

1.0 MATAZAMIO YA MUDA MREFU
Kuhakikisha maeneo yote ya mradi katika eneo la Sambasha/Olmotonyi/Kitakuu yanaoteshwa na msitu unafunga kama ilivyokuwa zamani

- Kuhakikisha vile vyanzo vyote vya mito, vinalindwa na vinatoa maji kama ilivyokuwa awali
- Kuhakikisha kuwa uharibifu katika miti ilivyotajwa unaofanywa na wanadamu na mifugo unakomeshwa mara moja

2.0 MIKAKATI
2 1 Kamati ya Mazingira itakaa na ofisi ya Mradi (Mkuu wa Safu) na kuonyesha mipaka ya msitu
2 2 faini kwa kila mfugo utakaokamatwa ndani ya msitu wa Hifadhi utatozwa shs 20,000 00 na katika faini hiyo 10,000 00 itabaki kijijini, shs 5,000 00 gharama ya operation na 5,000 00 iingizwe Serikalini Na hivyo hivyo nguzo na mazao mengine ya msitu kama itakavyoainishwa kwa makubaliano ya ofisi na kijij

3 0 Wataelekezwa madaraka na mipaka yao ya kaz

4.0 Watachekezwa namna ya uandikaji wa ripoti e.g. patrol zilizofanyika
- Watuhumiwa waliokamatwa, wahalifu sugu
- Kiasi cha faini iliyopatikana.
- Ripoti hiyo itatolewa kila mwezi kwa Meneja Mradi na nakala itapelekwa kwa Mwenyekiti wa kijiji.

4.0 UTEKELEZAJI

4.1 Eneo litabaki kuwa na Hifadhi ya Msitu wa Meru. Na itakuwa chini ya umiliki wa Mkurugenzi wa Misitu na Nyuki.

4.2 Serikali ya kijiji kwa kutumia kamati yake ya mazingira, itafanya kazi zake kwa ushirikiano wa ofisi na Mradi wa Misitu Meru na kufuata maagizo ya Mkuu wa Safu.

4.3 Kwa kuwa Mradi huu ni wa majaribio tutakuwa na makubaliano ya miezi mitatu mitatu, na baadaye kama hali itaonekana kuwa nzuri muda huo utaongezwa.

4.4 Ikiwa makubaliano/malengo ya makubaliano hayatafikiwa ofisi yangu itajiondoa na kusitisha makubaliano hayo.

4.5 Watekelezaji wakuu watakuwa Serikali ya kijiji wakitumia kamati ya mazingira.

Kazi ya Serikali ya kijiji zitakuwa -
- Kuhakikisha sheria ndogo ndogo [illegible] kulinda misitu
- Kuhakikisha malengo ya makubaliano yanafikiwa
- Kuhakikisha kamati ya mazingira inafanya kazi yake
- Kushirikiana na ofisi ya Msitu katika masuala yanayohitaji utaalamu.

4.6 KAZI YA KAMATI YA MAZINGIRA
- Kusimamia shughuli zote na uhifadhi wa Msitu kama itakavyopangwa pamoja na Mkuu wa Safu (Ranger)
- Kupanga mikakati ya ulinzi
- Udhibiti wa shughuli zote za moto
- Kuhamasisha wanakijiji katika shughuli za uzimaji moto
- Watawajibika kwa Serikali ya kijiji
- Watakuwa daraja kati ya wananchi na Serikali ya kijiji
- Watawajibika katika kukomesha uchemshwaji wa pombe haramu ya gongo/piwa
- Watawajibika kukomesha kilimo cha bangi

5.7 WALINZI WA MSITU:
- Kama watakuwa ni walinzi kutoka kamati ya mazingira, hawatakuwa wa kudumu, watakuwa wakibadilishwa kila baada ya muda utakaokubalika (mfano miezi mitatu)
- Watachaguliwa na kamati ya mazingira kutoka kila kitongoji
- Wanapaswa kuwa ni vijana

- Hawataruhusiwa kupiga watu faini wala kupokea faini
- Wenyewe watalipwa mshahara katika viwango vya Serikali.

5.0 MANUFAA AMBAYO WANAKIJIJI WATAPATA

- Nguzo, fito, nyasi bila malipo kwa makubaliano na ofisi
- Mapato kutoka kwenye faini
- Kupata kutoka kwenye fungu la ustawishaji (Silviculture fee) e g 100,000/= kwa kila kijiji.
- Kuongezeka kwa maji katika mito
- Upungufu wa uharibifu wa udongo
- Msaada kwa Miradi ya kijiji kulingana na uwezo wa mradi eg Madawati, mbao n k.

MANUFAA AMBAYO SERIKALI ITAPATA

1. Ukamataji wa wahalifu katika msitu utafanywa na Serikali ya kijiji ikitumia kamati yake ya Mazingira na wanadoria na mkuu wa Safu
2. Kamati ya mazingira itahusika na katika shughuli zote za mioto na uoteshaji wa miti kwa kushirikiana na mkuu wa Safu na wanadoria.

MAKUBALIANO YATADUMU IKIWA

- Matukio ya moto yatapungua
- Wizi wa miti na nguzo utapungua
- Wapasuaji wa mbao wa mikono watapungua
- Uingizaji wa mifugo msituni utakwisha kabisa
- Ushirikiano utakuwa mzuri
- Gongo/pombe haitachemshwa
- Ukulima wa bangi utakomeshwa

Mwisho ikiwa makubaliano hayo utaafikiana nayo, naomba usaini na utekelezaji utaanza 01 07 2000

MENEJA MRADI MSITU MERU/USA
Forest Project Manager
MERU/USA

1. Mwenyekiti wa kijiji
2. Katibu wa kijiji
3. Mwenyekiti kamati ya Mazingira
4. Katibu kamati ya Mazingira