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

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ABSTRACT

The study aims at generating a knowledge base for effective governance of natural resources management by farmers from which lessons could be drawn for guiding appropriate natural resources management intervention. Data were collected using household questionnaires, Checklists for focus group discussions and key informants' interviews and participant observation. Beekeeping households were sampled purposively while non-beekeeping households were sampled randomly. Quantitative data collected were subjected to descriptive and inferential statistical analyses with the use of logistic regression analysis. Qualitative data were analysed using content analysis. Results showed that the majority of small-scale beekeepers (73%) were driven by economic interests than natural resources management and conservation. The results further reveal that the large group of individual farmers need to be mobilized into beekeepers' groups to accommodate natural resources conservation objectives. The most prevalent conflicts in the study area were between farmers practising apiculture and fellow farmers (74%), followed by beekeepers and neighbours (16%). Stakeholders' diverging interests in apiculture were significantly influenced by marital status, major economic activities, household size, and educational level ($p<0.05$). We conclude that economic interests override conservation and natural resources management, therefore efforts should be geared towards mobilizing small scale beekeepers into beekeeping groups where it can be possible to accommodate natural resources conservation objectives, thereby mitigating the effects of diverging interests and resource use conflicts. We recommend that other stakeholders such as faith-based organizations, research and training institutes be mobilised by the local government to facilitate the inclusion of individual beekeepers into different forms of association where it can be possible to accommodate conservation objectives.

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INTRODUCTION

The Eastern Arc Mountains which include the Usambara Mountains stretches for some 900 km from the southern part of Tanzania to the Taita Hills in south-coastal Kenya. These Mountains are a global biodiversity hotspot with more than 2,000 endemic species of plants and animals (Lovett and Wasser, 1993; URT, 2015). However, around 40 percent of the plant species (800 out of more than 2,000) and 2 percent of genera (16 of about 800) are estimated to be endemic (Lovett and

Wasser 1993; Lovett 1998; GEF 2002, URT 2015, Chacha 2020). The endemics are found in most of the forest types, as well as in intervening habitats such as rocky outcrops, heathland, montane grasslands, and wetlands (Lovett 1998, URT, 2015). Farming in the mountainous areas of Tanzania is the major source of income for the majority of households. However, recent, with increasing population and land scarcity, there has been an increase in farming on fragile lands including the valley bottoms and wetlands.

Bush fires are common in villages surrounding the mountainous areas of Tanzania including the Usambara Mountains. This is one of the major land degradations around the eastern Arc Mountains of Tanzania (Kilawe *et al*, 2020). The main sources of bush fires are land preparation, hunting, firewood collection, and honey gathering (Kimaro *et al*., 2010, Kilawe *et al*., 2020). These land degradation processes are manifested through extensive deforestation and encroachment on marginal lands, widespread runoff and erosion (Msita, 2013), reduced crop yields (Sanchez, 2002), and loss of biodiversity (GEF 2002). A reversal of land degradation requires livelihood options that change people's incentives, in particular the benefits and costs of resource use. Under these kinds of circumstances, win-win interventions in degraded ecosystems and buffer zones that satisfy both socio-economic demands and maintenance of the ecosystem's integrity are required. In Tanzania, apiculture is one such land use that has potential for conservation of natural resources while at the same time providing improved and sustainable livelihoods to the communities (Kimaro *et al.,* 2013, Teshome and Guta 2020). However, according to FAO (2007), it is argued that apiculture would not realize its potential if the needs, priorities, and constraints of the main stakeholders are not taken into consideration, It has also been noted in other studies (Mazorodze 2015, Berkes, Davidson-Hunt, and Davidson-Hunt. 1998; FAO, 2000; Blomley, 2003; Sanginga, Kamugisha, and Martin, 2007) that divergent interests generate tension and power struggle between various stakeholders.

It is therefore largely acknowledged that increased population and stakeholders' divergent interests have put excessive pressure on natural resources (NRs) leading to overexploitation, degradation, and resource use conflicts (Yap and Devlin 2015, Warner and Jones, 1998). Therefore, for effective conservation of NRs, the link between rural livelihoods and natural resource management is of fundamental importance to national prospects for economic growth and poverty reduction. This study was conducted to provide analysis of stakeholders' interests concerning apiculture at the local level to generate a knowledge base for effective governance of National Resource Management by farmers and to draw lessons for guiding conservation of NRs efforts in biodiversity hot spot areas.

METHODOLOGY

Description of the study area

The study was conducted in three agro-ecological zones namely the cold humid, cold dry, and warm dry located between 4^{o} 24' and 5^{o} 00' South and 38^{o} 10' - 38^{o} 36' East in West Usambara Mountains, Tanzania covering about 184 km^2 (Figure 1). The west Usambara Mountain has an area of 3,500 km^2 and accounts for about 12.8% of the Tanga Region. It is bordered with Korogwe District in the south and Mkinga District in the east, and Same District in Kilimanjaro Region to the northwest, and the Republic of Kenya to the northeast. The area has steep slopes of up to sixty percent and medium to high mountains with narrow valley bottoms (Vigiak, Van Loon, and Sterk, 2006). These variations in topography and aspects have created microclimates and land use complexes (Pfeiffer, 1990; Conte, 1999), hence with varied agro-ecological zones and conditions.

Smallholder farming is the main economic activity for the majority of the people in the Lushoto District (Neerinckx, 2006; Davis, Makundi, Machang'u, and Leirs, 2006). About 90% of the population in the district depends on smallholder farming. Most cultivation is done on sloping land where soil erosion is increasingly severe. The valley bottoms are intensively used for vegetable production whereby water from furrow irrigation is used for the production of horticultural crops. The dominant land uses include subsistence and cash crop agriculture (covering 58% of the area), orchards and commercial plantations (11%), indigenous protected forest reserves (16%), and pastures (15%) (Shemdoe, 2002).

The main cash crops are vegetables, fruits, and Irish potatoes, while maize (Zea mays), cassava (Manihot esculenta), beans (Phaseolus lunatus), and potato (Solanum tuberosum) are the main food crops (Kamugisha et al., 2007). The surveyed zones include warm dry (Mwangoi village), cold dry (Lukozi and Malindi villages), and cold humid comprising the villages

of Migambo and Lushoto suburbs. These areas are potential for the production of honey and other bee products due to their favorable climatic conditions and presence of various vegetation types (fruit plants and natural vegetation) which are best forages for honey bees (Msita, Kimaro, Deckers and Poesen, 2010).

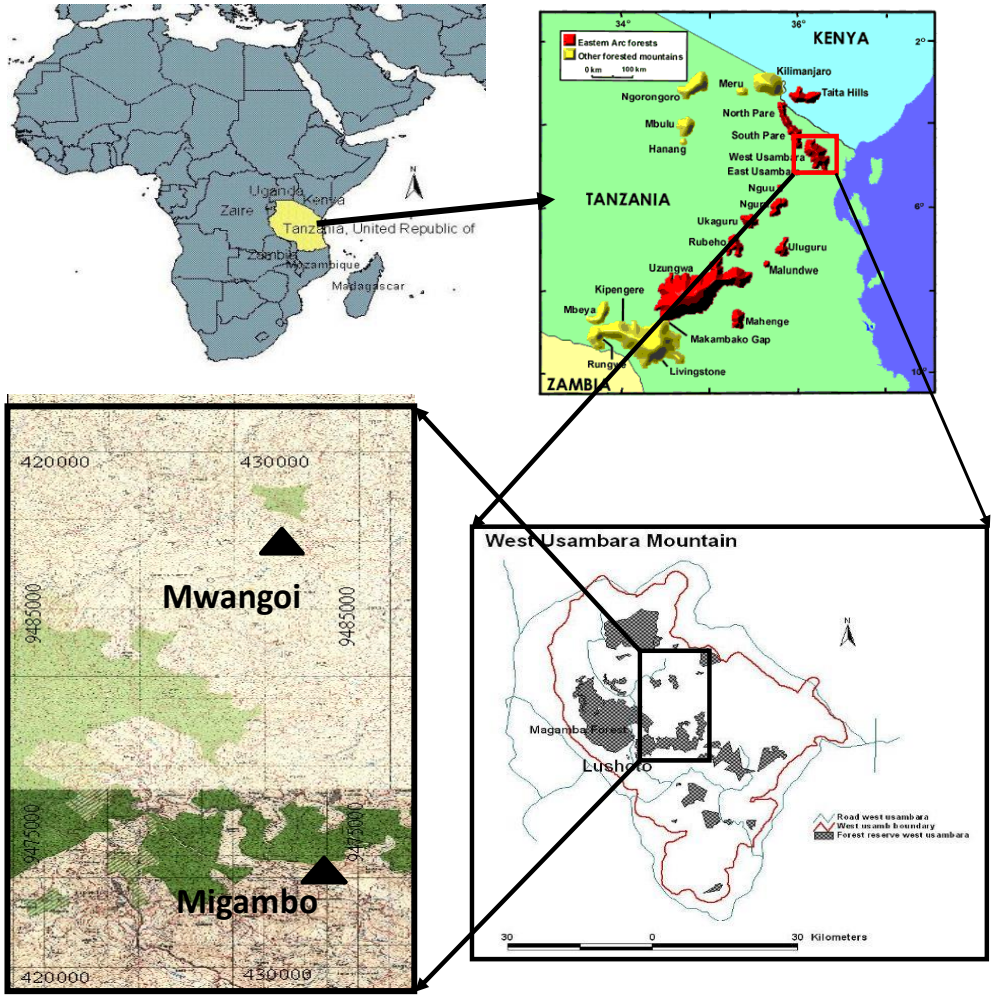

Figure 1. Location of the study area.

Data collection

The study employed a cross-sectional design which allows data to be collected at one point in time from a selected sample of respondents using standard survey techniques including household questionnaire survey, focus group discussions, participant observation, and key informants' interview. This design is used in descriptive studies for the determination of relationships of variables (Bailey, 1994).

A purposive sampling procedure was applied whereby the study area was stratified into three agro-ecological zones as indicated in Table 1. The sampling frames were the lists of individual beekeepers and non-beekeepers in each zone. In this study, it was considered that individuals are influenced differently by different socio-economic factors. Therefore, to isolate the factors we involved individual households representing small scale beekeepers as a cluster of stakeholders. Likewise, beekeeping groups, faith-based organizations (FBOs), and research and training institutions were also considered as entities with one voice in the way they responded to different issues concerning apiculture. Non-beekeepers were selected at random from a list of farmers that are not involved in beekeeping. A total of 98 respondents were interviewed using questionnaires to obtain primary data of the study area.

Table 1. Number of respondents interviewed from each agro-ecological zone in the study.

S/N	Agro-ecological zone	Sample size
1	Cold humid (Lushoto suburbs, Migambo village)	36
2	Cold dry (Lukozi and Malindi villages)	32
3	Warm dry (Mwangoi village and surroundings)	30
	Total	98

The data collected included, socio-economic factors of households, identification of stakeholders and their interests, major economic activities undertaken by households/stakeholders, type and nature of resource use conflicts. The socio-economic factors considered include age, household size, level of education, marital status, duration of residence in the area, level of interest in apiculture, and land size.

Tools that were used include Households questionnaire, focus group discussions (FGDs), key informants, and participant observation. Focus group discussions and key informant interviews were guided by a checklist of questions. Both tools targeted people with a fair understanding of apiculture including village chairpersons and Village Executive Officers, village elders of both sexes, and seasoned beekeepers. Others were members of Faith-Based Organisations (Roman Catholic and Lutheran Churches); schools, functional officers such as district beekeeping officers, natural resources officers, environmental officers, forest officers, and extension officers.

Data analysis

Content analysis (Singleton *et al*., 1993) was used to analyze the information collected through verbal discussions with the key informants and FGD. The data collected through structured questionnaires were analyzed using both descriptive and inferential statistical analyses carried out with Statistical Package for Social Sciences (SPSS 16.0). Frequencies and percentages, tables, and figures were used to present results. Inferential statistical analyses were carried out to provide an idea about whether the patterns described in the sample are likely to apply to the population from which the sample was taken. Logistic regression models were developed and used to establish the relationships between dependent and independent variables.

RESULTS AND DISCUSSION

Stakeholder's interests in apiculture and other related NRM in the study area

The list of various stakeholders and their respective interests in apiculture is presented in Table 2. The results show that the majority of small-scale beekeepers who constitute 73% of respondents were involved in apiculture with economic focus as their primary interest. On the other hand, beekeeping groups constituting 10% of the respondents showed high interest in both economic and conservation of natural resources followed by faith-based organizations (7%). MWAMBOA and TAMILWAI beekeeping groups in Mwangoi and Migambo villages were practicing beekeeping with the central objective of conserving river banks and water sources while at the same time aiming at income generation. The beekeeping practices have been evolving from using traditional beehives where logs, barks, and pots are being used (in this study termed as traditional beekeeping). The study considered improved beekeeping only where there is an improvement in the use of beehives with improved technology such as the use of Sokoine University of Agriculture (SUA) Improved Tanzanian Top-bar Beehive (SUA-ITATOBE) and the like. These results are similar to those described by Woodcock (2002) in the Eastern Arc Mountains, Tanzania, who noted that stakeholders' interests in natural resource management were influenced by economic demands, livelihood needs, institutional mandate, and geographical proximity (adjacency) to the natural resources.

Apiculture in developing countries is commonly viewed as a pro-poor income-generating activity (Lietaer, 2009; FAO, 2009). This fact is attributed to its low start-up capital and labor requirements. It is apparent from this study that organizing small-scale farmers into beekeeping groups tends to enhance their interests in apiculture to conserve natural resources while at the same time providing sustainable alternative livelihood (Ranthore and Jain, 2005). Moreover, Table 2 indicates that economic interest particularly earning more cash to secure household income was a key driving interest even though conservation concerns are also important. Therefore, this study provides insights on stakeholders'

multiple and diverse interests ranging from natural resource use, conservation, income generation, and accessibility to forest goods and services concerning apiculture. This information is vital for guiding natural resource conservation efforts and management of resource use conflicts. Perception of households regarding the importance of apiculture, major economic activities undertaken, different interest categories, influencing types and nature of resource use conflicts as described by Grimble and Wellard (1997) and Warner and Jones (1998).

Table 2. Types of interests by various stakeholders in apiculture in the study area.

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

TAFORI = Tanzania Forest Research Institute, SEKOMU = Sebastian Kolowa Memorial University and ASARECA = Association for Strengthening Agricultural Research in Eastern and Central Africa.

Types of resource use conflict concerning interests prevalent in apiculture in the study area

Results indicated that main stakeholder's interests concerning apiculture in study area are economic and conservation of natural resources (Table 2). Different competing interests lead to resource use conflicts. This include conflicts between beekeepers and their fellow farmers, which resulted from some bees biting farmers passing close to the beehives, and in some cases out of jealous that the other is harvesting honey. Table 2 show that the conflict between beekeepers and other farmers was the most prevalent accounting for 74.2%. Other reported conflicts were between beekeepers and their neighbours (16.1%), individuals and beekeeping groups (6.5%), and individuals within the beekeeping groups. The nature of conflicts identified in the study area occurs and arise out of jealousy (beekeepers and fellow farmers), quick financial gains, uncontrolled bush fires (individuals and beekeeping groups), cutting poles where beekeepers have placed the apiary (Beekeepers & neighbors), and mistrust (within the beekeeping group members). The results suggest that there are more conflicts when beekeepers operate as individuals than in groups. Decision on development of land development is always contested among different interests e.g decision to keep bees while the neighbors do not accept because of the varied interests. Resource use conflicts often emerge because stakeholders have different interests in

natural and cultural resources (Matthias, 2005; Sanginga et al., 2007).

Factors Influencing stakeholders' diverging interests in Apiculture in the study area

Table 4 presents the results on key factors influencing stakeholders' diverging interests in apiculture in the study area. The results indicate that household size, level of education, marital status, and major economic activities had a significant ($p < 0.05$) influence on stakeholders' diverging interests in apiculture while age, sex, and ethnicity were not significant ($p > 0.05$).

Table 3. Types of resource use conflict concerning interest in apiculture in various agro-ecological zones in study area.

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

Numbers in brackets denote percentages

Table 4. Factors influencing stakeholders' diverging interests in apiculture in the study area.

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

Note: *= R^2=78, Significant at $p < 0.05$; Ns =Not significant at $p > 0.05$

Household size

Table 4 shows that household size significantly increased the likelihood of stakeholders' diverging interests ($P<0.05$) by a factor of 4.821. This implies that the larger the household size the higher the chances that members of the household would develop diverse interests in various livelihood strategies. This factor is thus likely to contribute positively to apiculture and hence natural resource management because apiculture has an economic incentive (Lalika and Machangu, 2008).

Level of education

Table 4 also shows that level of education of respondent significantly increased the likelihood of stakeholders' diverging interests in apiculture and $p < 0.05$ by a factor of 1.411. Since the odd ratio is the measure of the effect size or the ratio of relative importance of the independent variable in terms of the effect on the dependent variable's odds, the results reveal that increasing level of education has relatively small effect. An increase in the level of education of the communities has been reported in many studies to be associated with an increase in the awareness of the communities on natural resource management (Kajembe, 1994; Mbwilo, 2002). For example, Katani (1999) in his study in Mwanza District, Tanzania demonstrated that an increase in the level of education increases the interest and willingness of local communities to participate in natural resource management such as tree planting and contour farming.

Marital status

The results in Table 4 show that the marital status of the respondents significantly increased the likelihood of stakeholders' diverging interests and $p < 0.05$ by a factor of 22.133. Since the odd ratio is the measure of the effect size or the ratio of relative importance of the independent variable in terms of the effect on the dependent variable's odds, the results reveal that marital status had the greatest effect as compared to

other factors. The plausible explanation is that married households have relatively larger families which calls for household heads to diversify livelihood strategies in order to make the ends meet in the family (Kessy, 1998). This in turn calls for households to explore and expand their interests in diverse livelihood activities which may include apiculture. Mayeta (2004) reported that marital status influences decision-making at the household level, including the use of natural resources.

Major economic activities

The results in Table 4 show that major economic activities significantly increased the likelihoods of stakeholders' diverging interests' $p < 0.05$ by a factor of 11.471. In the study area, given the nature of major economic activities such as annual cropping, vegetable production, livestock farming and apiculture, coupled with land scarcity, increased multiple interests which exert pressure on natural resources including land, water, and forests (Mowo *et al.,* 2002). Introduction of modern beekeeping by SUA–ASARECA project was an innovative technological intervention that likely to influence communities' multiple interests in major economic activities towards conservation of natural resources (Kimaro *et al.,* 2010). The other factors including age, sex, land size and ethnicity were not statistically significant and were not considered in the discussion.

CONCLUSIONS AND RECOMMENDATIONS

The stakeholders involved in apiculture in the study area have diverse interests including natural resource conservation and livelihood mainly driven by socio-economic interests. About 73% of the stakeholders were the small-scale individual beekeepers whose interest is mainly economic (household income). The other groups that include the beekeeping groups, Faith Based Organizations and research and training institutes had conservation and management of natural resources as part of their objective in keeping the bees. Mobilizing small-scale beekeepers into groups would help to manage and mitigate stakeholders diverging interests in apiculture concerning natural resource conservation and management while accommodating other important interests.

The conflict between beekeepers and famers was the most prevalent (74.2%) in the study area. The conflicts are attributed to stakeholders' diverging interests for natural resources utilization largely influenced by economic interests and other decisions on land use and conservation of natural resources mainly biodiversity conservation, conservation of catchments, forest conservation, capacity building and research and development.

Factors that significantly influenced stakeholders diverging interests include Household size ($p=0.006$), Education level ($p=0.01$), marital status ($p=0.011$) and Major economic activities ($p=0.029$). Other factors were not significant. Since the odd ratio is the measure of the effect size or the ratio of relative importance of the independent variable in terms of the effect on the dependent variable's odds, marital status had the greatest effect followed by Major economic activities. This indicates that married housed hold heads had the tendency to diversify their livelihood strategies thereby increasing the like hood of diverging interests, likewise types of major economic activities that the household is involved in.

We recommend that efforts be directed towards promotion of apiculture as an important economic activity to all the households and creation of beekeeping groups so as to reduce the divergence of interest. We recommend the other stakeholders such as faith-based organizations, research and training institutes and Beekeepers groups be mobilised by the local government to facilitate inclusion of individual beekeepers into different forms of association where it can be easy to accommodate conservation objectives. In this case farmers who will also be practicing beekeeping will have common interest towards apiculture, which apart from income it is important in crop production and conservation of natural resources including forest, river banks, catchment areas and biodiversity. The same will also mitigate and manage resource use conflicts in beekeeping and natural resources management and thereby improving household income and natural resources conservation.

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