

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/283290157>

The impact of land tenure and degradation on adoption of agroforestry in Uluguru mountains forest, Tanzania

Article · November 2012

CITATION

1

READS

319

1 author:



[Tryphone Muhamba](#)

Sokoine University of Agriculture (SUA)

35 PUBLICATIONS 278 CITATIONS

[SEE PROFILE](#)

Some of the authors of this publication are also working on these related projects:



McKnight Foundation Bean Bruchid Resistance Project [View project](#)

Full Length Research Paper

The impact of land tenure and degradation on adoption of agroforestry in Uluguru mountains forest, Tanzania

Sosthenes Ruheza¹ George Muhamba Tryphone² and Zuena K. Khamis*³

¹Tumaini University, Iringa University College, P.O. Box 200, Iringa Tanzania.

²Department of Crop Science and Production, Sokoine University of Agriculture, P.O.Box 3005, Chuo Kikuu, Morogoro Tanzania.

³Mzumbe University, School of Public Administration and Management, P. O. Box 2, Mzumbe, Morogoro Tanzania.

Accepted 23 August 2012

The influence of land tenure and land degradation on adoption of Agroforestry practices can not be overstated. A study was carried in Tandai village in Uluguru Mountains of Morogoro Rural District, Tanzania, to investigate on the impact of land tenure and degradation on the adoption of agroforestry methods and practices. A total of 50 heads of households, which is approximately 15% of the total number of farmers in the study area were respondents of the study. Questionnaire and checklist questions were used to collect primary data from farmers, government and Non-governmental officials respectively. Results show that although 98% of the respondents owned farmlands, 58% were not satisfied with their farm sizes. The study also revealed that 92% of the respondents said that the only way for acquiring extra farmland is through buying while 8% of the respondents said that they can inherit from their parents and/uncles. Of the respondents, 72% were aware of the causes to land degradation in their farmlands. From this study it is argued that low rate of adoption of agroforestry in Uluguru Mountains Forests might be not because of farmers' resistance to change but due to a complex and sensitive land tenure systems which is one among other factors underpinning adoption of the practices. However, farmers' awareness on intensity and causes of the land degradation on their farms, and their acknowledgement on the significance of agroforestry methods and practices for land conservation is a meaningful capital to facilitate adoption of the practices within the complex and sensitive land tenure system in Uluguru mountains forests.

Key words: Adoption, land tenure, land degradation, agroforestry, Uluguru mountains.

INTRODUCTION

The separation between agroforestry and other land use systems is the interaction and composition of the trees on the same piece of land as food crops and animals. According to ACTA, (2004) agroforestry is a deliberate cultivation of trees and shrubs on the same farmland. Similarly, Munishi et al. (2006) compounded that retention and/or tree planting in farmland is one of the popular agroforestry practices in many traditions. For the purpose and scope of this study, agroforestry is perceived as a purposive practices of planting trees and/retaining trees on farms with symbiotic relationship between human being, trees, crops and livestock, where

as such integration can either be in a spatial or in temporal sequences. In light of this (ICRAF, 1990 cited in Ruheza et al; 2011) point out that Agroforestry is a collective name for land use systems and practices where woody perennial are deliberately integrated with crops and/or animals in the same management unit.

Advantages of agroforestry among others include its contribution in control of soil erosion, conservation of soil fertility through nutrient recycling and enhancement of biodiversity (Sanchez, 1995) Other benefits include the increase in income from the same piece of land and provision of fuel wood, fodder, fruits and timbers. It worth noting that agroforestry contributes to increased productivity of farms as the practices is an intensified use of land, hence increase production per unit area, at the same time diversifying people's sources of livelihoods'

*Corresponding Author E-mail: zkruheza@gmail.com

income and spread risks from on-farm investments.

Land scarcity in Uluguru Mountains is both a challenging phenomenon that is also complicated by the fact that land is mainly controlled by a head of a clan (Uncle), and an individual can acquire a farmland through inheritance, where as an individual allocated a piece of land has no absolute rights on that land (Mbwambo, 2007 and URT, 2009). For Examples, In their studies in Uluguru Mountains, (Mbwambo, 2007) found that land can handed down to the husband by his wife but he is not allowed to sell or plant tree on the same piece of land, and in areas where land is acquired paternally, land is mostly dedicated to perennial cash crops as compared to subsistence food crops in matrilineal land inheritance system, as a land planted with perennial crops is considered as an individual property and other clan members cannot access it (Ohymas, 2000).

Agroforestry methods and practices have been advocated for smallholder farmers in the Uluguru Mountains as a remedy to the problem of land degradation, but its rate of adoption has been disappointing regardless of farmers being aware of the significances of the methods and practices addressing the problem of land degradation.

Arguing on the impact of Land tenure system on adoption of agroforestry, (Sabban and Victoria, 1993 and Contreras-Hermosilla and Chip, 2005) emphasized that land tenure systems have been not only being posing fundamental challenges to adoption and dissemination of agroforestry technologies, but also in development of new farming systems. Similarly, Bakengesa et al; (2004) argued that land insecurity, is significantly influencing adoption of agroforestry methods and practices.

Several studies on land conservation also revealed that in most cases farmers are not likely to engage in land conservation and management practices, such as agroforestry methods and practices unless they become aware of land degradation problems facing them (Dejene et al; 1997 and Anim, 1999). Such awareness and perception of the profits to be accrued out of the land conservation practices are major factors for investments and adoption of any conservation measure (Anim, 1999). It is from such a background, the objective of this study was to describe land tenure system and land degradation in the study area and their impact on adoption of agroforestry in Uluguru Mountains.

MATERIALS AND METHODS

The study area

The study was carried out at Tandai village in Kinole Ward, Mkuyuni division in the year 2007 (Figure. 1). Tandai village in Mkuyuni division in Morogoro rural district, Tanzania. The division lies on the Eastern part of Uluguru Mountains Forests at altitude between 400 meter above sea level (m. a. s. l) and approximately 1000 m. a. s. l. The Tandai village borders the Uluguru Mountains Forests, the forests that are globally recognized for their uniques biological

resources (Lovette et al; 1995; Perkin et al; 2002 cited by Wilfred, et al; 2007), and support livelihood of million people for various material and services resources such as agricultural produces, water, medicines and cultural services just to name a few.

Research design

A cross-sectional research design involving collection of information from representative population samples in one time duration at a single point (Devaus, 2002) was used in this study as it has high degree of flexibility in consideration of different aspects of a problem understudy (Kothari, 2004), such as the influence of land tenure and land degradation on adoption of agroforestry methods and practices.

Sampling procedure

The study involved smallholder farmers in Tandai village who grew agricultural crops and/or trees. According to (URT, 2003), a smallholder farmers (peasants) is the one who is cultivating a farmlands of an average size ranging between 0.9 hectare (2.25 acres) to (7.5 acres), respectively. Therefore most of the study respondents are smallholder farmers (69 %) having a farmland ranging between less than 1 and 3.5 hectares. The sampling unit was the head of a household. The simple random sampling technique was applied to select respondents for the study. A sample size of 50 heads of households which was about 15% of smallholder farmers in the study area were selected using a table of random numbers from the list of heads of households prepared during the 2002 national census (URT, 2003).

Data collection and analysis

Primary data were collected by administering a structured questionnaire to the 50 respondents. The questionnaire was composed of close and open-ended questions to capture the respondents' belief and aspirations on unbiased basis. Secondary data were collected from Sokoine National Agricultural Library (SNAL), University College of Dublin (UCD), the Uluguru Mountains Biodiversity Conservation Project (UMBCP), the Uluguru Mountains Agricultural Development Project (UMADEP) and from Tanzania national website.

Both qualitative and quantitative data were summarized, coded and analyzed using Statistical Package for Social Sciences (SPSS) computer software. Descriptive statistics were made to analyze quantitative data in order to obtain frequencies and percentages where necessary.

Results and Discussion

Farm ownership and satisfaction to farm size

The results in Table 1 show the distribution of respondents by farmland ownership and satisfaction/dissatisfaction with the size of their farmlands. Ninety five percentage (95%) of the respondents indicated that they owned farms. This has an implication in the adoption of agroforestry practices. However, results further show that most of the respondents (53%) were not satisfied with the farm size they owned. In his study in Mkuyuni division, Ohymas

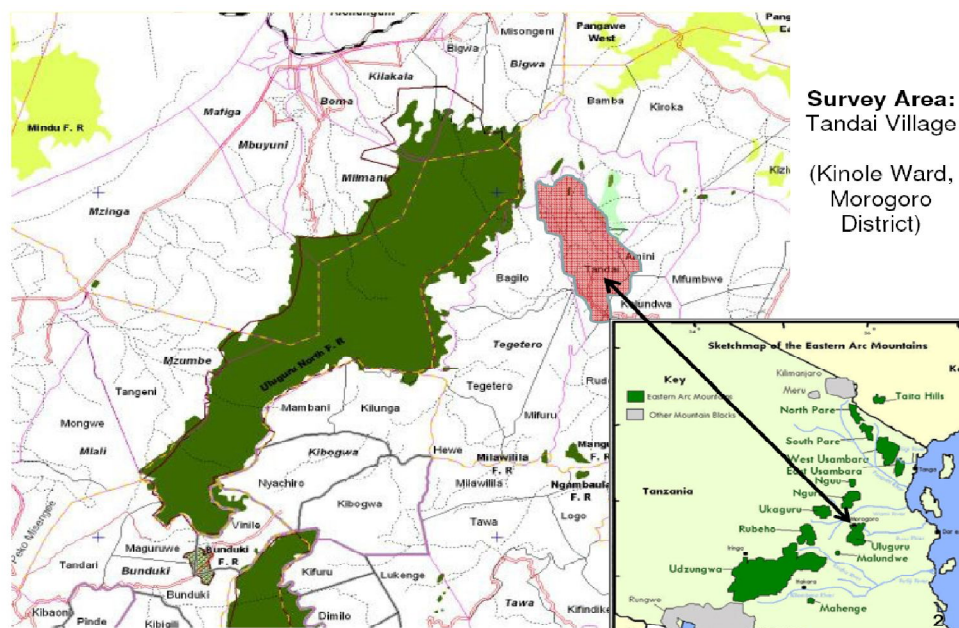


Figure 1. A map of the Uluguru Mountains Forests, showing a study area. Source: ICRAF, (2010).

Table 1. Distribution of respondents by their household farm size

Farm size (ha)	Frequency*	Percentage
0.8	6	12.2
1.5-2.0	22	45.0
2.5-3.5	6	12.2
4.0-6.0	7	14.3
<0.6	8	16.3
Total	49	100
Satisfaction to farmland Size		
Yes	23	47
No	26	53
Total	49	100

*One respondent had no farmland

(2000) found that a decrease in fallow periods is a result of a significant decrease on the household farm size and hence dissatisfaction.

The study further show that household farm sizes ranged between less than 0.8ha and more than 6ha of the respondents, 12% had farm size of less than 0.8 ha while 45% had farms of between 1.5 and 2.0 ha (Table 2), 12% and 14% of the respondents had farm sizes of 2.5 to 3.5 ha and 4.0 to 6.0ha respectively. Only 16% of the respondents had more than 6.0ha. These results contradict findings by (Ohymas, 2000) who found that, the minimum farm size in same village was 1.0ha and a maximum of 1.5ha. This suggests that, land holdings differ significantly within and between different areas in

the Uluguru Mountains. In light of this, URT (2009) also found that in Uluguru Mountains, some individuals may have ample farmland that is inherited from parents while others may have little or nothing. The author further argued that there is a need of developing a mechanism, such as tax payment per size of land owned so as to stimulate redistribution of land as it would be a burden for those with large farmlands. It is from these findings and arguments it is argued by the study that poor adoption of agroforestry methods and practices might be because farmlands are increasingly becoming scarce and farmers with small farms perceive planting trees and/retaining trees in their farms could lead to decrease in productivity of other annual crops needed in supporting their

subsistence livelihood strategies.

Acquisition of farm lands

Table 2 presents distribution of respondents by their way of obtaining extra farmland. Results show that, most of the respondents (92%) acquire extra farmland through buying from other farmers with relatively large farms. 8% of the respondents said that, they could acquire extra farmland through inheritance from their parents and/or uncles. Similar findings in Uluguru Mountains were reported by Mbwambo (2007) who found that, on average 65% of the respondents do acquire farmland through inheritance in villages with poor market opportunities as compared to only on average 28% of the respondents in villages with good market opportunities (Such as in a study area), as poor market opportunities reduce land market demand and values as a consequences most of land is still acquired through inheritance. This implies that there is decrease in the clan farmland that can be passed on to sons, as a result of increased human population and commercialization of land particularly in areas with good market opportunities.

Arguing on the influence of land tenure on adoption of agroforestry, (Mwihomeke et al., 1999) put it very clearly that traditional land tenure in Uluguru is a disincentive to tree planting activities, as many people who hire lands and/or farm on clan lands where planting trees is restricted. (Ohymas, 2006) further stressed that the relationship between a farmer and his/her farmland determines the type of crops to be grown. In instances when an individual is renting land he/she is not allowed to plant trees or other perennial crops on that land regardless of the number of years they are going to farm on the same farmland. Similarly, (ACTA, 2004) revealed that land ownership is a crucial factor for adoption of agroforestry, as people who do not have access and right to land, may be reluctant in adopting long-term investment(s) on the land as the land may be taken away from them, and usually not allowed to plant trees on the land under such a tendency rules. This suggests that there is a need to understand the issues of land tree ownership on the same piece of land and tree ownership on the same piece of land and who has the right to harvest some or all of the products at anytime or certain times of the year as these will determine the necessary incentives for agroforestry in the context of the particular community/culture (Cook, & Michael, 1991).

Therefore land – tree ownership might be one among other factors underpinning adoption of agroforestry methods and practices, as those inherit and/or renting farmland cannot plant trees on those farmlands.

Farm size nexus number of tree planted/retained on farm

The distribution of respondents by the association

between farm size and the number of trees planted and/or retained on farm is shown on Table 3. Results show that most of the respondents (54%) with small farm size planted less than 150 trees compared to (67% and 47%) of the respondents with medium and large farm size who planted less than 150 trees respectively. Results also show that (53%) of the respondents with large farm size planted more than 150 trees compared to (33% and 46%) of the respondents with medium and small farm size respectively. Results further show that there is a trend between the numbers of trees planted and farm size. However, there is no significant association between farm size and the number of trees planted ($\chi^2 = 0.695$; $P=0.093$).

Similar results were observed by Rocheleau, (1998) who pointed out that; farmers with larger farms were able to adopt long-term conservation practices such as agroforestry methods and practices on their farm when compared with small farms. This might be due to the fact that farmers with small farm sizes tend to invest on short-term practices such agricultural production for their subsistence livelihood rather than on long-term investments practices such as tree planting and/or retaining.

Arguing on the influence of economic gains on adoption of agroforestry, (ACTA, 2004) put it very clearly that an innovation that have a long-term benefits with no immediate benefits normally discourage poor families who are struggling just to survive, as they may not have the time, energy or money to invest in long term projects, such as agroforestry. It is therefore be argued that farmers with small farmland could not easily adopt agroforestry as it is a long-term investments while for them subsistence livelihood is their mostly priority.

Land degradation and types of land degradation

Results on Table 4 show that (74%) of the respondents had different land degradation problems on their farms. This implies that most farmers face different types of land degradation on their farms and this might be one of the factors that led to the decrease in crop production and increasingly clearance of forest lands, so as to obtain virgin and fertile farmlands. Kilasara et al. (1993) found that 71% of people in Tandai village acknowledged land degradation on their farms.

A decrease in soil fertility (73%) and physical soil erosion (27%) were perceived by respondents as the main forms of land degradation (Table 4). This implies that, land degradation in the Uluguru Mountains is not only a problem based on the perception of development and environmental conservation practitioners but also appreciated by local people and they can distinguish between different types of land degradation based on their own criteria. Arguing on the influence of awareness and intensity of the problem on adoption of an innovation

Table 2. Distribution of Respondents by the ways in Obtaining Extra Farmland.

Ways of acquiring extra farmland	Frequency	Percentage
Buying	46	92
Inherit	4	8
Total	50	100

Table 3. The Association between Farm Size and the numbers of Tree Planted.

Number of trees planted	Farm size (acres)		
	Small(<5 acres)	Medium(6–9 acres)	Large (10 - 15 acres)
< 150	15 (54 %)	4 (67 %)	7 (47 %)
> 150	13 (46 %)	2 (33 %)	8 (53 %)
Total	28 (100 %)	6 (100)	15 (100)

Chi-square = 0. 695; P=0.093

Table 4. Distribution of Respondents by Land Degradation and Types of Land Degradation in their Farmland.

Problem of land degradation	Frequency	Percentage
Yes	37	74
No	13	26
Total	50	100
Perceived type of land degradation		
Decrease in soil fertility	27	73
Soil erosion and decrease in soil fertility	10	27
Total	37	100

*13 respondents had no problems of land degradation on their farmlands.

that is perceived to be a remedy to such a problem, Anim, (1999) put it very clearly that farmers are more likely to adopt a land conservation and management methods and practices once they become aware of the problem and intensity of such a problem to their livelihood strategies. This suggests that as farmers' awareness to the existences and intensity of land degradation on their farm land might be an incentive to adoption of agroforestry methods and practices in Tandai village.

Perceived causes of land degradation

Distribution of respondents with land degradation on their farms by the perceived causes of land degradation is presented on Table 5. Results show that cultivation on the same piece of land over years was one of the reasons that were contributing to land degradation to most of the respondents with land degradation problems (62%).

The study further found that of the 37 respondents, 27% said farming on steep slopes (marginal lands) was the main reason for land degradation in their farms and 11% of respondents did not know the cause of land

degradation in their farms. This implies that, most farmers were not only aware of the problem of land degradation in their farms, but also of farming practices that were contributing to the problem. From such findings it can be argued that their involvement in activities that were contributing to land degradation was not because of lack of awareness to their consequence but might be due to the shortage of farm lands and the lack of other alternatives.

According to village leaders bush fires and pit sawing are also reported to be other main reasons for land degradation, as people do open up new farmlands following pit sawing. In favor of the significance of bush fires and land degradation Wilfred et al. (2007) reported that slash and burn is a major land preparation method that has been attributing to land degradation. Other practices include short fallow periods, and farming in previously forested land.

This suggest that farmers' engagement on activities that are attributing to land degradation on their farmlands is not lack of awareness of the impacts of their land malpractices but because of the problem of land scarcity and high dependence on extensive agricultural farming system.

Table 5. Distribution of Respondents with Land Degradation in their Farms by the Reasons for Land Degradation

Perceived Causes of Land Degradation	Frequency	Percentage
Cultivation on the same piece of land over years	23	62
Farming on the steep slopes	10	27
Don't know	4	11
Total	37	100

Table 6. Distribution of respondents with land degradation problems in their farms by their proposed land conservation measures

Proposed solutions for land conservation	Frequency	Percentage
Contour planting and mulching	23	62
Fallowing and tree planting	5	14
Don't know	9	24
Total	37	100

Traditional land conservation methods

Results from Table 6 show that contour planting and mulching were proposed by most of the respondents (62%) as the best practices for land conservation on their farms. Of the respondents 24% did not propose any conservation measures while 14% said fallowing and tree planting were their best measures for land conservation. This suggests that farmers were knowledgeable about different traditional practices that can be used for land conservation on their farms.

Similarly, in their study in Tandai village, Wilfred et al (2004) revealed that 70% of the respondents claimed that the use of contours made up of grasses, shrubs, trees and crop residues have been a traditional way of conserving land degradation, and such practices have significantly contribute to nutrient recycling.

Therefore, low percentage (14%) of farmers' preference on agroforestry might be due to the complexity and sensitivity of the existing land tenure system and other demographic & socio-economic forces in the study area rather than farmers' resistant to change.

However, the existing local land conservation methods and practices should be assessed based on their strengths and weakness and develop the most appropriate alternative conservation measures based on farmers' knowledge and resources. Furthermore, farmers traditional land conservation measures conform well to agroforestry methods and practices, and therefore this local knowledge can be utilized to facilitate adoption of agroforestry in Uluguru Mountains forests.

Conclusion

From this study, it can be concluded that regardless of farmers in Uluguru Mountains Forests being aware of problems of land degradation on their farms and the

popularity and advantages of agroforestry methods and practices as a remedy to problems of land degradation, its adoption might has been influenced by the existing complex and sensitive traditional land tenure systems, particularly matrilineal land inheritance system. Conclusively, adoption of agroforestry in Uluguru Mountains Forests can be realized if agroforestry systems to be promoted to the areas take account of the complex and sensitive land tenure systems in the area in terms of farm size and acquisition of farmlands that determine land – tree relationships.

ACKNOWLEDGEMENT

We are greatly indebted to the Irish Government which provided the funds for this study. Also, ICOS members support and cooperation are highly appreciated. Farmers and government leaders in Tandai ward are acknowledged for their cooperation during the study.

REFERENCES

- Anim FDK (1999). A note on the adoption of soil conservation measures in the northern province of south Africa. *J. agric. Econ.*, 50 (2): 336-345.
- Bakengesa SS, Otsyina R, O'king'ati A (2004). Influence of National Policies on Tree Planting and Conservation: The Case of Agroforestry Technologies in Shinyanga Tanzania. In: Rao MR, Kwesiga FR (Eds.), *Proceedings of the Regional Agroforestry Conference on Agroforestry Impacts on Livelihoods in South Africa: Putting Research into Practice*. 301-306.
- Cook C, Grut M (1991). *Agroforestry in sub Saharan Africa: farmers' perspective*. The World Bank.
- ATCA, (2004). *Agroforestry*. Technical Centre for Agricultural and Rural Development Co-operation, Wagenigen, Netherlands (3).
- Dejene A, Shishira EK, Yanda PZ, Johnsen FH (1997). *Land Degradation in Tanzania World Bank Technical Paper*.
- DeVaus (2002). *Surveys in Social Research (5th eds)*. Allen and Unwin, Australia.
- Hermosilla AC, Fay C (2005). *Strengthening Forest Management in*

- Indonesia through Land Tenure Reform: Issues and Framework for Action.
- ICRAF (2010). Bioenergy Value Chain Analysis Household Survey, Tandai, Tanzania.
- Kilasara N, Rutatora DF (1993). The social economic and land use factors affecting the land degradation of Uluguru catchment in Morogoro, Tanzania. In: Rutachokozibwa V, et al (1993) (Eds). Agriculture and the environment. TSAEE and CSE: 42-44.
- Kothari CR (2004). Research Methodology: Methods and Techniques (2 Eds). New Age International Publisher, Delhi, India.
- Mbwambo J (2007). Agrobiodiversity and Food Security among Smallholder Farmers in Uluguru Mountains, Tanzania. A thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy of Sokoine University of Agriculture: 177.
- Munishi PKT, Philipina F, Temu RPC (2006). On-farm tree resources and farmer motives for on-farm tree retention and management in Bumbuli Ward, Lushoto District, North Western Tanzania. In: Chamshama SAO, Nshubemuki L, Iddi S, Swai RE, Mhando ML, Sabas E, Balama C, Mbwambo L, Mndolwa MA (Eds). Proceedings of Second National Agroforestry and Environmental Awareness: Partnership and Linkages for Greater Impact in Agroforestry and Environmental Awareness: 188-198.
- Mwihomeke ST, Zilihona JEE, Hamisy WC, Mwaseba D (1999). Assessment of forest users group and their relationship to the condition of the natural forests in the Uluguru Mountains (Unpublished).
- Ohymas O (2000). Assessment of the remaining forests on the Uluguru and the pressure that they face. A report for CARE Tanzania and Uluguru Mountains Biodiversity Conservation Project: 45.
- Rocheleau D, Weber F, Field-Juma A, (1998). Agroforestry in dry land Africa. International Council for Research in Agroforestry (ICRAF) Nairobi, Kenya: 15.
- Ruheza S, Tryphone GM, Mbwambo JS, Khamis Z.K, Swella G, Mushobozy DK (2012). Studies on the influence of tree tenure on the adoption of agroforestry practices in Uluguru Mountain, Tanzania. J. for Agric. 2 (5): 170 – 178.
- Sabban Maria V (1993). Managing Decentralization in Social forestry: A review of issues and strategies in the Philippines. Working paper series No.sf- 03, Participatory resource management program, De La Salle University, Manila.
- Sanchez PA (1995). Science in agroforestry. Agroforestry systems 30: 54 - 55.
- URT (2009). Uluguru Mountains Management Framework. Ministry of Natural Resources and Tourism, Forestry and Beekeeping Division.
- URT(2003). Country profile: The National website (www.tanzania.go.tz).
- Wilfred P, Madoffe SS, Luoga EJ (2007). The Role of Institutions in Biodiversity Conservation in Northern Uluguru Mountains, Morogoro, Tanzania: The Villagers' Perspectives. Discover Innovation. 19. (Special edition 1 and 2): 15-24.