Impacts of Microfinance on Livelihoods and Environmental Conservation in Tanzania: Local Communities in the Uluguru Mountains Case Study

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ABBREVIATIONS AND ACRONYMS

^{o}C	Degrees Celsius
IGA	Income-Generating Activities
MF	Microfinance
PWR	Participatory Wealth Ranking
SACCOs	Savings and Credit Cooperative Societies
VS & L	Village Savings and Loan

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ABSTRACT

This paper presents the results of research undertaken to assess the impacts of MF services on livelihoods and environmental conservation. The overall objective was to assess the effectiveness of different MF models in reducing income poverty and inducing the adoption of environmental conservation practices in local communities living adjacent to the Uluguru Mountains. Results from this study found a strong statistical association between changes in the type of income generation activities and access to loans from MF institutions, which implies the creation of new business enterprises as a result of access to loans from MF. The study's empirical evidence did not support the hypothesis that access to MF services and level of poverty influence attitudes to environmental conservation and engagement in environmentally destructive activities, particularly the use of fire for land preparation. Also, the evidence revealed strong association between beneficiaries of MF services and the use of alien farming practices perceived to enhance environmental conservation, notably terraces, contour farming and crop rotation. However, being MF beneficiaries had no influence on the use of indigenous farming practices known to conserve the environment, such as tree planting and natural fallow. Evidence suggests that lack of adoption of conventional environmental conservation practices among the poor, poorest, and/or non-beneficiaries of MF services is actually a result of inherent to the overall market and policy failures. These factors are responsible for preventing the poor and the poorest and/or non-beneficiaries of MF institutions from accessing necessary information regarding the introduced conservation practices. Without access to such information the poor and the poorest, as well as non-beneficiaries of MF institutions, cannot be expected to adopt these practices in the same way as the non-poor.

Key words: microfinance, livelihoods, environmental conservation

1.0 INTRODUCTION

1.1 Background

For the past three decades the role of microfinance (MF) services in poverty reduction has attracted significant amounts of interest from both policy makers and academia (Dunford, 2006). The emergence of microcredit, and later MF, was envisaged as being able to reach the millions of unbanked poor and poorest households, due to formal banks' shallow outreach to the poor (World Bank, 2007a). The basic MF premise is that hundreds of millions of the poor and poorest are resilient entrepreneurs and hard workers, but they lack investment capital and cannot access loans from formal banks because they have no collateral, which constrains their routes out of poverty (Banerjee and Duflo, 2007). Microfinance is seen as a means to provide financial services, including credit to the poor and poorest who are otherwise regarded as "not creditworthy". Thus, MF is considered to be one of the strategies for poverty reduction and improvement in the standard of living of the poor (URT, 2005, 2010a).

Over the last three decades there has been a paradigm shift from exclusion to integration of the needs of people (including poverty reduction) in the conservation of natural resources such as forests and biodiversity (Rands et al., 2010). This has necessitated the integration of community-based natural resource management with MF services, especially Rotating Savings and Credit Associations (ROSACAs) and enterprise enhancement (Anderson et al., 2002). It is assumed that increased access to rural MF services (credit and savings) will stimulate the creation of new enterprises that provide alternatives to replace environmentally destructive activities such as charcoal making, lumbering (Anderson et al., *2002*), and subsistence poaching. Yet empirical evidence is lacking.

Despite the rhetoric about access to MF services, there is little more than anecdotal evidence to support claims about its positive impacts on both poverty reduction and environmental conservation. In the literature, empirical evidence on the poverty impacts of access to MF services are ambiguous and inconclusive (Duvendack et al., 2011). Apparently, the differences observed between MF beneficiaries and non-beneficiaries are attributable to unobserved

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characteristics of these groups, rather than access to MF services per se (Tedeschi, 2008; Duvendack et al., 2011).Robust studies have reported neutral (Morduch, 1998) or negative (Fraser and Kazi, 2004; Weiss and Montgomery, 2004; Coleman, 2006; Roodman and Morduch, 2009) impacts of MF services on poverty. One reason for these conflicting results is the way authors have defined communities. Most studies that have reported positive impacts of access to MF services on poverty have treated communities as homogeneous entities (Kessy and Urio, 2006). In studies which have taken the now widely-accepted view that communities are in fact highly differentiated, the picture is different (Hulme, 2000; Duvendack et al., 2011). Regarding the impacts of MF on environmental conservation, very little has been done and there are no conclusive results (Anderson et al., 2002; Wild et al., 2008).

The current study suggests that access to MF services (from either informal, semi-formal, or formal institutions) is good for providing reliable sources of investment capital for better-off community members. However, it may have detrimental impacts on poverty reduction resulting from the exclusion of the poor and poorest community members. In this respect, the informal Village Savings and Loan (VS & L) system may be far better at reaching the poorest as opposed to the Savings and Credit Cooperatives (SACCOs) which are the semi-formal member-based microfinance institutions. Similarly, empirical evidence from this study suggests that access to proper extension services, rather than MF services or level of poverty, determines attitudes towards environmental conservation and ultimately engagement with or restraint from environmentally destructive activities such as use of fire in land preparation. Therefore, the failure of the poor and poorest to adopt environmental conservation practices can be better explained by the pertinent underlying problems inherent to overall market and policy failures, rather than being poor or non-MF beneficiaries. This report summarizes the results of research undertaken to assess the impacts of microfinance services on poverty reduction and environmental conservation in four villages located in the Uluguru Mountains in Morogoro, Tanzania.

1.2   *Structure of the Report*

The report is divided into eight main sections: 1) introduction, 2) statement of the problem, 3) conceptual framework, 4) research objectives and questions, 5) description of the study area, 6) study methodology, 7) research findings and discussion, and 8) conclusion and recommendations.

2.0.   STATEMENT OF THE PROBLEM

Poverty and environmental degradation such as deforestation, soil erosion, and the siltation of rivers continue to be the most prominent development issues in Tanzania (URT, 2005, 2010a, b, c), in sub-Saharan Africa, and worldwide (World Bank, 2007b). Thus, strategies formulated primarily for poverty alleviation such as MF, especially in rural areas, are inadvertently considered appropriate to simultaneously achieve environmental conservation outcomes (Murali, 2006; Bawa et al., 2007). However, empirical evidence regarding the poverty impacts of MF services has been positive (e.g. Kessy and Urio, 2006), neutral, and negative (e.g. Scully, 2004). There is little or no empirical evidence to show the effects of access to MF services on poverty reduction or environmental conservation (Wild et al., 2008). Similar to most conventional social studies, MF impact studies and research on the linkage of poverty to environmental conservation have treated communities as homogenous entities. As a result, these studies fail to adequately assess the impacts on different wealth categories, and the impacts of the activities of different wealth categories on the environment. In such cases, general conclusions from such studies remain unrealistic as they are unlikely to apply across different social categories. Therefore, this study assessed the impacts of access to MF services on poverty reduction and environmental conservation across different wealth categories.

3.0   CONCEPTUAL FRAMEWORK

Figure 1 illustrates the schematic framework of the impact of access to MF services on poverty reduction and environmental conservation, within which factors likely to determine livelihood outcomes in terms of changes in household incomes and the effects of household activities on the environment are elaborated. According to Jones (2002) and Nelson et al. (2006), the effects of household activities on environmental sustainability depend on the adoption of environmental conservation measures. Furthermore, Tenge et al. (2004) and FBD (2008) found a strong statistical association between engagement in off-farm activities and the adoption of environmental conservation practices. Off-farm activities depends on two factors: (1) access to microfinance services, particularly credit and savings that stimulate off-farm activities (Anderson et al., 2002), and (2) access to agricultural extension services that influence farmers' access to knowledge on environmental conservation practices (Jones, 2002; Tenge et al. 2004).
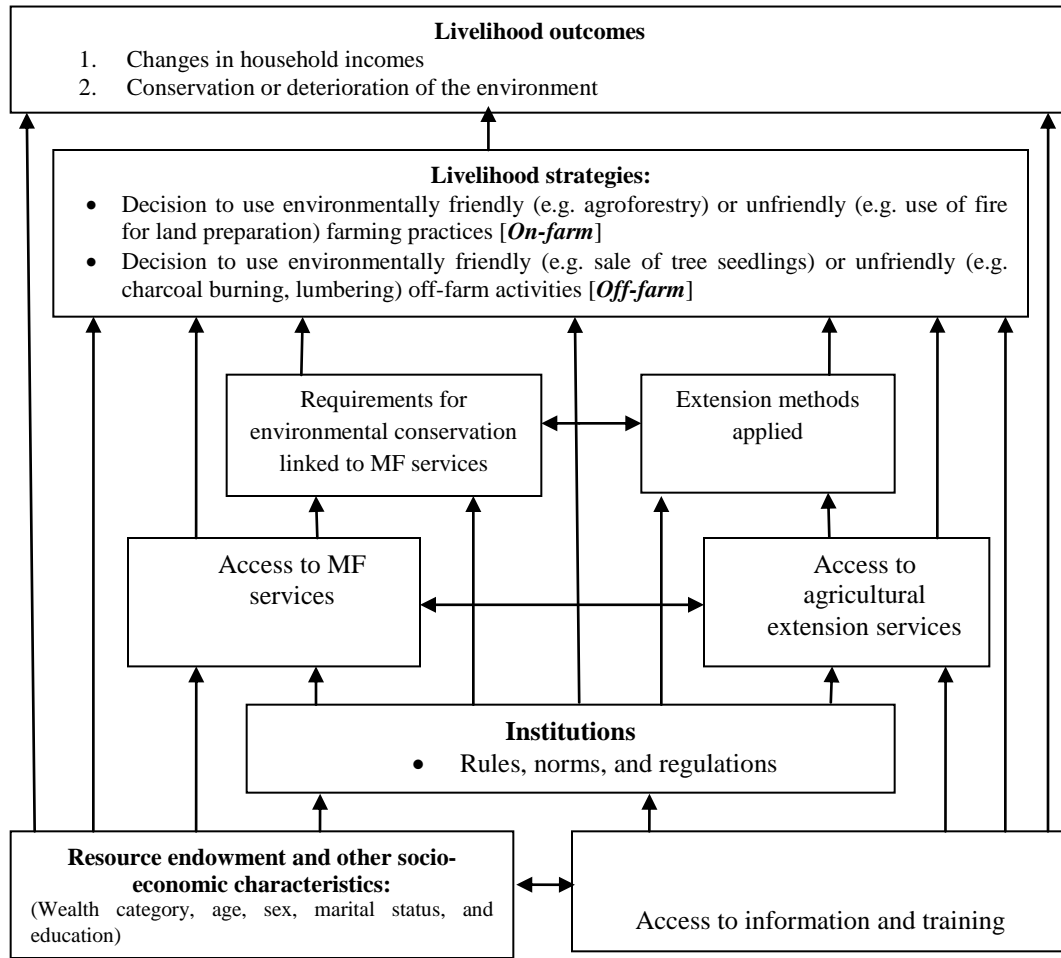
Figure 1: Conceptual framework for the analysis of impacts of MF services on income poverty and environmental conservation among communities in the Uluguru Mountains of Morogoro, Tanzania

However, these two factors themselves are influenced by a myriad of other interacting factors (Nelson et al., 2006), notably resource endowment and institutional factors (Tenge et al. 2004).

Past studies that attempted to analyse the impacts of MF on poverty (Collins et al., 2009) and the adoption of environmental conservation practices (Tenge et al. 2004) have paid little or no attention to the influence of variations associated with different social groups, which entail resource endowment (Ravnborg, 2003; URT, 2008). This study incorporates the explicit influence of the variation between social groups to explain relationships between access to

microfinance and extension services, and their respective impacts on income poverty and the adoption of environment conservation practices. Based on this analysis, the subsequent paragraphs articulate the relationships between these factors as conceptualized and applied in this study.

(a) Access to microfinance services

Levels of access to MF services differ across households and are influenced by the following two factors: (1) institutions as defined by rules, norms, and regulations that govern eligibility to access a given type of MF service, and (2) household resource endowment and other socio-economic characteristics that include the wealth category of the household, the education level of the head, age, marital status, and sex. The influence of access to microfinance services on types of livelihood strategies can be either spontaneous or mediated through conditions attached to MF services. For example, Wild et al. (2008) and URT (2010b) found that VS & L as a MF model was associated with positive impacts on environmental conservation that were attributed to rules that reprimanded any member involved in environmentally destructive activities.

On the other hand, because they have less resource endowment the poor and poorest households may not be able to access MF services, especially if they are required to pay upfront contributions such as savings before they are allowed to borrow money. Furthermore, apart from the influence of access to MF and extension services, a household's choice of on-farm and off-farm activities depends on its resource endowments, including skills acquired through training, and the nature and type of information accessed available to such households.

(b) Access to agricultural extension services

Agricultural extension services may be tailored to alien or indigenous farming practices. The non-poor and less poor who have land may have personal interests in land management practices being tested on their land. Furthermore, asset endowment and access to information interact with available institutions to determine whether a household has access to extension services whose effects on the choice of livelihood strategies may occur directly or through mediated interaction with the type of extension methods applied. In the case of mediated effects, participatory

extension methods that apply to demonstration plots (Jones, 1996, 2002) are likely to encourage the choice of more sustainable livelihood strategies than top-down approaches.

Based on the foregoing discussion the outcomes of access to MF services, in terms of both household incomes and environmental conservation, are not straightforward. The final outcome is a result of mediation processes involving the type and nature of on-farm and off-farm activities in which a given household ultimately decides to engage itself. In other words, being MF beneficiary does not necessarily translate into improved household income unless the household uses loans or savings from MF to invest in profitable livelihood strategies. Similarly, access to MF does not simply translate into the adoption of environmental conservation practices unless there are conditions to oblige the MF beneficiaries to adopt such practices.

4.0   RESEARCH OBJECTIVES AND RESEARCH QUESTIONS

4.1   *Research Objectives*

4.1.1   General Objective

The overall objective was to assess the effectiveness of different MF models in reducing income poverty and inducing the adoption of environmental conservation practices in local communities in the Uluguru Mountains in Morogoro, Tanzania.

4.1.2   Specific Objectives

Specifically, the study was intended to address the following aspects:

1) To determine whether and how household poverty level relates to access to loans from different microfinance schemes;
2) To evaluate the contribution of different microfinance schemes to household income, employment, and new business creation;
3) To assess the relationship between household poverty level and the use of environmental conservation practices;
4) To assess relationships between households' access to different microfinance schemes and their attitudes towards conservation and the adoption of environmental conservation practices.

4.2   *Research Questions*

This study was guided by the following questions:

 i) To what extent does household poverty level influence access to loans from different microfinance schemes?
 ii) To what extent do different microfinance schemes contribute to household income, employment, and new business creation?
iii) To what extent do household poverty levels influence the use of environmental conservation practices?

iv) To what extent do household poverty levels influence engagement in environmentally destructive activities?

v) To what extent does household participation in microfinance schemes affect attitudes towards conservation and the adoption of environmental conservation practices?

4.3   *Limitations of the Study*

The linkage of microfinance services to both poverty and environmental conservation is a complex phenomenon. Therefore, this study was unable to cover all aspects of poverty and environmental conservation. The study concentrated on analyses at the micro level that captured the perspectives of microfinance service users, but which may not reflect the perspectives of policy makers at the meso and macro levels. However, the study findings provide relevant information that can be applied by policy makers at all levels.

5.0   DESCRIPTION OF THE STUDY AREA

The Uluguru Mountains, which cover an area of 30 by 60 km and rise over 2600 m above sea level, are 200 km to the west of Dar es Salaam and form a deeply dissected landscape (Jones, 2002). The mountains consist of two distinct areas, Uluguru North and Uluguru South, with the Bunduki corridor between them. **Figure 2** shows villages in the Uluguru Mountains and the location of the study villages. The mountains support a high population density, in some areas exceeding 200 persons per square kilometre. Average annual rainfall for the whole area exceeds 1500 mm per annum (Temple, 1972, cited in Jones, 1996). Rainfall varies in different places in the Uluguru Mountains.
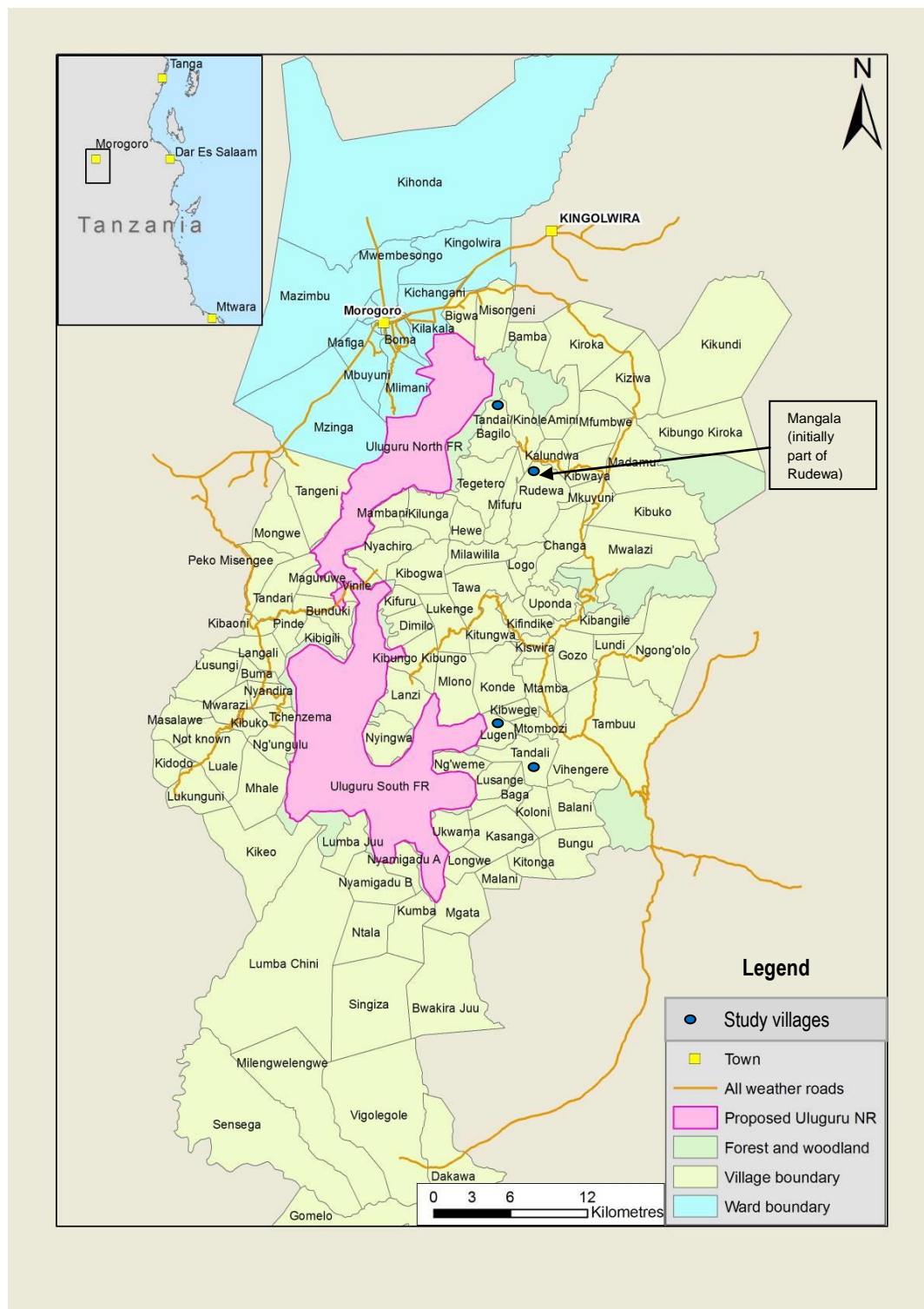
Figure 2: A map showing villages in the Uluguru Mountains and the location of the study villages in the Uluguru Mountains of Morogoro, Tanzania

Source: modified from URT (2009)

The study villages are located on the eastern slopes, which receive the highest rainfall of 2500 to 4000 mm per annum, usually without a distinct dry season, compared to 900 mm in Morogoro Municipality and 1200 to 3100 mm on the drier western slopes, where there are clear dry and wet seasons (Lovett and Pocs, 1993). The Uluguru Mountain area is also characterized by cool weather, with mean maximum and minimum temperatures of 20–22°C and 15–17°C respectively, and much colder than this (-7°C) at high altitudes where frost may occur in July and August (Lovett and Pocs, 1993).

6.0   METHODOLOGY

6.1   Study Design

6.1.1   Overview

The study consisted of two major parts. The first was designed to develop a poverty profile for each of the studied villages in order to provide a sampling frame and explore whether and how the level of household poverty, based on locally defined criteria and indicators, related to access to MF services and the adoption of environmental conservation practices. The second part was designed to gain insight into the actual situation with respect to access to MF services, the dynamics of livelihood status, attitudes to environmental conservation, and the adoption of environmental conservation practices (ECPs). For the purpose of this study, ECPs are defined as those practices that enhance the utilization of land/soil, forest, and water resources without jeopardizing the ability of the natural systems to provide these resources for future generations.

6.1.2   Wealth Ranking

Participatory wealth ranking (PWR) was conducted at sub-village level upon arrival at each study village so as to establish poverty profiles based on people's own perceptions of poverty. The choice to use self-perceived poverty rankings was inspired by the fact that poverty and well-being cannot be practically measured on the basis of income or expenditure data (Sen, 1985), and the multidimensional nature of poverty, which justifies the importance of including poor people's own perceptions in poverty assessments (Narayan et al., 2000).

PWR participants were three to five people selected with the help of sub-village and village leaders, who knew the sub-village well. Criteria and indicators for each wealth category were developed in a focus group discussion (FGD) session in which participants from all sub-villages in a village took part. Thereafter, participants were split into their respective sub-village groups, where they used the criteria and indicators developed in the FGD to characterize the wealth categories of households in their sub-village. Initially, four wealth categories (poorest, poor, less

poor, and non-poor) were identified. However, the application of a quantitative poverty scoring system described by Ravnborg (2003), based on quantification of the locally defined poverty indicators from the household questionnaire survey, revealed no difference between the wealth groups that were initially defined as less poor and non-poor. Thus, the less poor group was combined with the non-poor households to yield three wealth categories, i.e. poorest, poor, and non-poor. The list of households grouped by wealth categories served as the sampling frame for a stratified random sample.

6.2   *Sampling Procedure*

6.2.1   Selection of Sample Villages

Purposive and simple random sampling techniques were combined to select the study villages. In the first stage the Morogoro district was purposively selected on the basis of its location within the Uluguru Mountain landscape, and because of the presence of both formal and informal MF institutions. Thereafter, simple random sampling was used to select two wards, and then two villages were selected from each of the sampled wards, also using a simple random sampling technique.

6.2.2   Household Sampling and Sample Size

Stratified random sampling in proportion to the size of the wealth categories was applied to select sample households in each village. Whenever possible the minimum number of sampled households for each category was five, except in cases where some wealth categories had fewer than five households. The numbers of households sampled from wealth categories and the sampling intensity for each study village are shown in **Table 1**. The characteristics of the community-defined wealth categories are described in section 7.1.

Table 1: Number of sampled households and sampling intensities for each of the study villages in the Uluguru Mountains of Morogoro, Tanzania

Village	Total number of households	Samples based on wealth categories				Sampling intensity (%)
		Non-poor	Poor	Poorest	Total	
Tandai	1153	15	22	9	46	4.0
Mangala	288	6	31	17	54	19.0
Lugeni	247	20	24	9	53	21.5
Tandali	248	21	16	14	51	21.0
All villages	**1936**	**62**	**93**	**49**	**204**	**10.5**

Initially the sample size was set to 60 households per study village, but this was not achieved due to the non-attendance of some prospective respondents. Thus the actual sample size ranged from 46 in Tandai to 54 in Mangala. This gave a total sample of 204 households, and sampling intensity ranging from 4% in Tandai to 21.5% in Lugeni. The overall sampling intensity for all villages was 10.5% (**Table 1**).

6.3 Data Collection

The study utilized both primary and secondary data on the MF and ECPs common in the Uluguru Mountains. Primary data were both quantitative and qualitative. Quantitative data were collected using a structured questionnaire with both close-ended and open-ended questions, which was administered to the heads of sampled households. Qualitative data were collected using a combination of participatory rural appraisal (PRA) techniques including key informant interviews, participatory wealth ranking, and focus group discussions. The quantitative data provided insights with respect to situations at the household level, whereas the qualitative data captured issues pertinent to the entire village or the community as a whole. Secondary data were obtained from reviews of relevant reports from previous development and conservation projects in the area, reports from respective village offices, and the District Council.

6.4   Data Analysis

6.4.1   Overview

Quantitative data were coded and entered into Statistical Package for Social Science (SPSS) and STATA computer software. Descriptive analyses such as percentages, multiple responses, correlation, and cross-tabulation were conducted. In addition, inferential statistical analysis was carried out to guide decisions about the acceptance or rejection of the envisaged research hypotheses. Inferential statistical analysis included chi-square tests of association. A logistic regression analysis was done via STATA Version 11.1.

6.4.2   Logistic Regression Analysis

Logistic regression was used to examine the determinants of access to MF services from both formal and informal institutions. Success or failure to access MF was taken as a binary outcome, where the response probability was predicted as a linear function of the explanatory variables (Maddala, 1983). The treatment decision was defined as a binary outcome of access to MF services by the respondent in the sample area, "1" being assigned for respondents who were beneficiaries of MF institutions and "0" otherwise. Then the response probability was expressed as follows:

$$Log(\frac{p}{1-p}) = \alpha_0 + \alpha_1 x_1 + \alpha_2 x_2 + \alpha_i x_i \dots\dots\dots\dots\dots\dots(1)$$

where $\alpha_0, \alpha_1, \alpha_2, \dots \alpha_i$ denote estimated coefficients for respective covariates (predictors), $x_1, x_2, \dots x_i$ denote independent variables, and p is defined as the probability of event (1, 0).

It was assumed that access to MF services could be influenced by 1) age of the respondent, 2) gender of the respondent, 3) education level of the respondent, 4) wealth category of the respondent, 5) household size, 6) total land size, and 7) proximity of the respondent to a financial institution. From equation (1), variables that determine the extent of access to MF services were empirically defined as follows:

$$Y_i = \beta_0 + \beta_1 A + \beta_2 Ed_1 + \beta_3 Ed_2 + \beta_4 D + \beta_5 Land + \beta_6 Gend + \beta_7 HS + \beta_8 WC_2 + \beta_9 WC_3 + \varepsilon_i \ \text{.......(2)}$$

where:

Y_i = access to MF services by i^{th} respondents (1 = Access and 0 = No access)

A = age of the respondent (years)

$Gend$ = gender of the respondent (dummy variable: 1 for female, otherwise 0)

Ed = education level of the respondent (dummy variable: 1 for no formal education; otherwise 0)

D = distance from the location of MF institutions (km)

HS = household size of the respondents

WC = wealth category of the respondent as dummy variable (1 = non-poor/less poor, 2 = poor and 3 = poorest)

$Land$ = total land size owned by the respondent

β_0 = constant

$\beta_1..., \beta_9$ = coefficients of MF services access with respect to explanatory variables of the respondent, and

ε_i = regression error

7.0   RESEARCH FINDINGS AND DISCUSSION

7.1   *Characteristics of Community-defined Wealth Categories*

Findings of the participatory wealth ranking (PWR) conducted in the four study villages revealed substantial similarities in the characteristics that were considered by community members to define relative poverty and wealth (**Table 2**). The pattern corroborates the findings of previous independent studies in the same area (Ellis and Mdoe, 2003) and other parts of Tanzania (Vyamana, 2009).

Overall, the non-poor are endowed with brick houses with cement floors and iron roofs, land holdings of 2.45 hectares or more and sometimes up to 4.9 hectares, 5 or more pigs, 10 or more goats, and 10 or more chickens. They hire labour but never sell labour; they can always afford to pay for the required education for their children and medical services for the entire household; they grow cash crops on a relatively large scale, engage in non-farm businesses, and are normally food sufficient throughout the year. The less poor households are endowed with increasingly fewer of these assets, they sell more labour, and they experience worsening transient food insecurity. The poor have little or no land or livestock, rely almost entirely on selling labour or on food aid, and are food insecure for almost the whole year.

Table 2: Characteristics of wealth categories in the study villages in the Uluguru Mountains of Morogoro, Tanzania

Assets	Well-being categories		
	Non-poor	Less-poor	Poorest
House	Brick wall, cement floor, and iron roof	Houses made of mud brick wall, mud floor, and iron roof	Houses made of pole and mud walls, mud floor, and grass thatched roof
Land owned	2.45 hectares or more, in some cases reaching 4.9 hectares	0.74 to 2.45 hectares; may rent land	0.25 to 0.98 hectares; may rent out land as they have no or little capacity to cultivate all of the small land they own
Livestock	Own 5 or more pigs, 10 or more goats and 10 or more chickens	Own 3 to 4 pigs, 5 to 9 goats and 1 to 9 chickens	No livestock in most cases but occasionally may own up to 2 chickens
Food security	They have plenty of food for 5 to 8 months a year where they get 3 or more meals a day and can choose what to eat; for 4 to 7 months food becomes a little bit scarce but they can still afford 3 meals a day, though they may not choose what to eat	Food secure for 5 months a year when they can afford 3 meals a day, and moderately food insecure for the other 7 months when they can only afford 2 meals a day	Severely food insecure for 7 months a year, getting only 1 meal a day, and may require food aid in some cases; insecure for 4 months, getting 2 meals a day
Labour market	Hire labour but never sell labour	May hire labour but sometimes also sell labour	Sell labour
Off-farm activities	May do trading and own a kiosk, own grain milling machine, and may own VT/video show hall	Petty trading of goat and pig meat, and live goats and pigs	Petty trading, particularly brewing local beer
Access to education and medical services	They can afford to pay for all required school fees for their children, and can afford to pay for all medical services they require	Can only afford to pay for their children's education up to primary level, and can only afford medical services for simple illness	Children hardly get primary education or medical services apart from traditional healing
Type of cash crops grown	Produce cash crops (bananas, beans, cassava, and cloves) on relatively large acreage, and harvest is twice as much compared to the medium income	Produce cash crops (bananas, beans, cassava, and cloves) but the acreage and harvest are 50% less compared to the non-poor	No specialized cash crop production, but occasionally sell part of their food crops to earn some cash

7.2 *Socio-Economic Characteristics of the Sample Households*

In this study, the variables selected to describe the sample's main characteristics were marital status and educational level (**Table 3**). Generally the respondents' education level was low in all villages surveyed, since there were more than 40% who did not attend school beyond primary level.

Table 3: Socio-economic profile of sample households in the study villages in the Uluguru Mountains of Morogoro, Tanzania

Characteristics	Values†				
	Tandai (n = 46)	Mangala (n = 54)	Tandali (n = 51)	Lugeni (n = 53)	**Overall (n = 204)**
Percentage of females among respondents	43.5	44.4	30.2	37.3	**38.7**
Percentage of males among respondents	56.5	55.6	69.8	62.7	**61.3**
Percentage of respondents employed in agriculture	95.7	98.1	100.0	98.0	**98.0**
Percentage of respondents employed in business and small business	4.3	0.0	0.0	2.0	**1.5**
Percentage of respondents who had primary school education	47.8	40.7	86.8	78.4	**63.7**
Percentage of respondents who had secondary education	0.0	0.0	1.9	2.0	**1.0**
Percentage of respondents with no formal education	52.2	59.3	11.3	19.6	**35.3**

† Addition of percentages is not equal to 100 due to multiple responses

The results in **Table 3** show that agriculture (farming and livestock keeping) was the main economic activity reported by at least 95% of respondents across the studied villages. However, employment in business and small business was generally low and confined to Tandai (4.3%) and Lugeni (2.0%) villages. The two villages with some engagement in business and small business happened to be those that had previous contacts with external agents through development, and/or with conservation projects (URT, 2009). Conversely, Tandai village, which recorded relatively high participation in business and small business, had the exceptional advantage of having better roads and a modern marketplace.

7.3 *Major Livelihood Activities and Associated Household Incomes*

7.3.1 Major Livelihood Activities

Responses on livelihood activities for each wealth category in the four study villages are presented in **Table 4**. Overall, the main livelihood activity across wealth categories was agriculture, reported by more than 98% of respondents regardless of wealth category. However, there was significant variation ($\chi^2 = 4.087$; df = 2; p = 0.043) among wealth categories with respect to engagement in business. The tendency was for more engagement among the non-poor in business and the sale of agricultural crops than among the poor and poorest.

Table 4: Percentage of responses on major livelihood activities by wealth category in the study villages in the Uluguru Mountains of Morogoro, Tanzania

Major livelihood activities	Percentage of respondents in wealth category†				Inferential statistics		
	Non-poor (n = 62)	Poor (n = 93)	Poorest (n = 49)	Overall (n = 204)	Linear-by-linear association chi-square value	Degrees of Freedom	Significance
Agriculture	100.0	96.8	98.0	98.0	0.740	2	0.390
Business (shop, kiosk, restaurant)	19.4	8.2	6.5	10.8	4.087	2	0.043
Sale of agricultural crops	17.7	15.1	6.1	13.7	2.947	2	0.086
Livestock keeping	4.8	1.1	4.1	2.9	0.121	2	0.728
Casual labour‡	,0.0	1.1	4.1	1.5	2.993	2	0.084
Handicraft	1.6	3.2	4.1	2.9	0.605	2	0.437
Carpentry	3.2	0.0	0.0	1.0	3.262	2	0.071
Masonry	1.6	1.1	0.0	1.0	0.708	2	0.400
Operating motorbike for hire	1.6	0.0	0.0	0.5	1.623	2	0.203

†Addition of percentages is not equal to 100 due to cross tabulation of multiple responses; ‡The livestock type for the non-poor included goats and pigs whereas the poor and poorest were keeping chickens only.

The business and sale of agricultural crops that were relatively dominated by the non-poor constitute off-farm activities that according to Ellis and Mdoe (2003) are important aspects of rural livelihood diversification. These are necessary to enhance efforts to move out of poverty and/or withstand livelihood shocks and trends.

7.3.2 Sources of Investment Capital for the Major Livelihood Activities

Analysis of the disaggregated village data using chi-square tests of association did not reveal any statistical association between wealth categories and their sources of investment for each of the various livelihood activities. Therefore the data were pooled and reanalysed to detect any statistical association between wealth category and sources of investment capital for different livelihood activities. Results related to the sources of investment capital by wealth category for each of the three important livelihood activities (i.e. agriculture, business, and sale of agricultural crops) (**Table 4**) are presented in **Figure 3** and **Appendix 1**.

With the exception of loans from VS & L, used for investment in the sale of agricultural crops, all wealth categories had similar sources of income for investment. The proportion of

respondents who used loans from a VS & L to invest in the sale of agricultural crops was significantly higher ($\chi^2 = 4.918$; df = 2; p = 0.027) among the non-poor (4.8%), medium for the poor (1.4%), and zero for the poorest. It is worth noting that SACCOs were not among the sources of investment capital for the sale of agricultural crops, which employed most of the poor and poorest.

Figure 4 and **Appendix 2** present variation among the studied villages with respect to sources of investment capital for agriculture, business, and the sale of agricultural crops. Of the sources of investment capital, significant differences among villages were evident in terms of the use of loans from SACCOs for investment in business ($\chi^2 = 5.945$; df = 3; p = 0.015), but not at all in sale of agricultural crops. The use of loans from SACCOs for investment in business was found in Tandai but not in the rest of the studied villages.

With relatively well developed infrastructure characterized by passable roads, high population density, and intensive agriculture, especially growing high value crops such as spices, fruits, and vegetables, Tandai village was an exception. Here, only 34.8% reported getting money for various livelihood activities from the sale of land. In contrast, the proportions of respondents from the other three villages were high for those who relied on money from the sale of land. This finding confirms what Nemes (2005) reported from Hungary, that rural areas face serious comparative disadvantages in the context of the growing local market competition. In the study area the comparative disadvantages originated from underdeveloped infrastructure and from a limited ability and resources to produce goods and services. The elimination of these comparative disadvantages would ensure fair competition and social and economic cohesion in the studied villages.
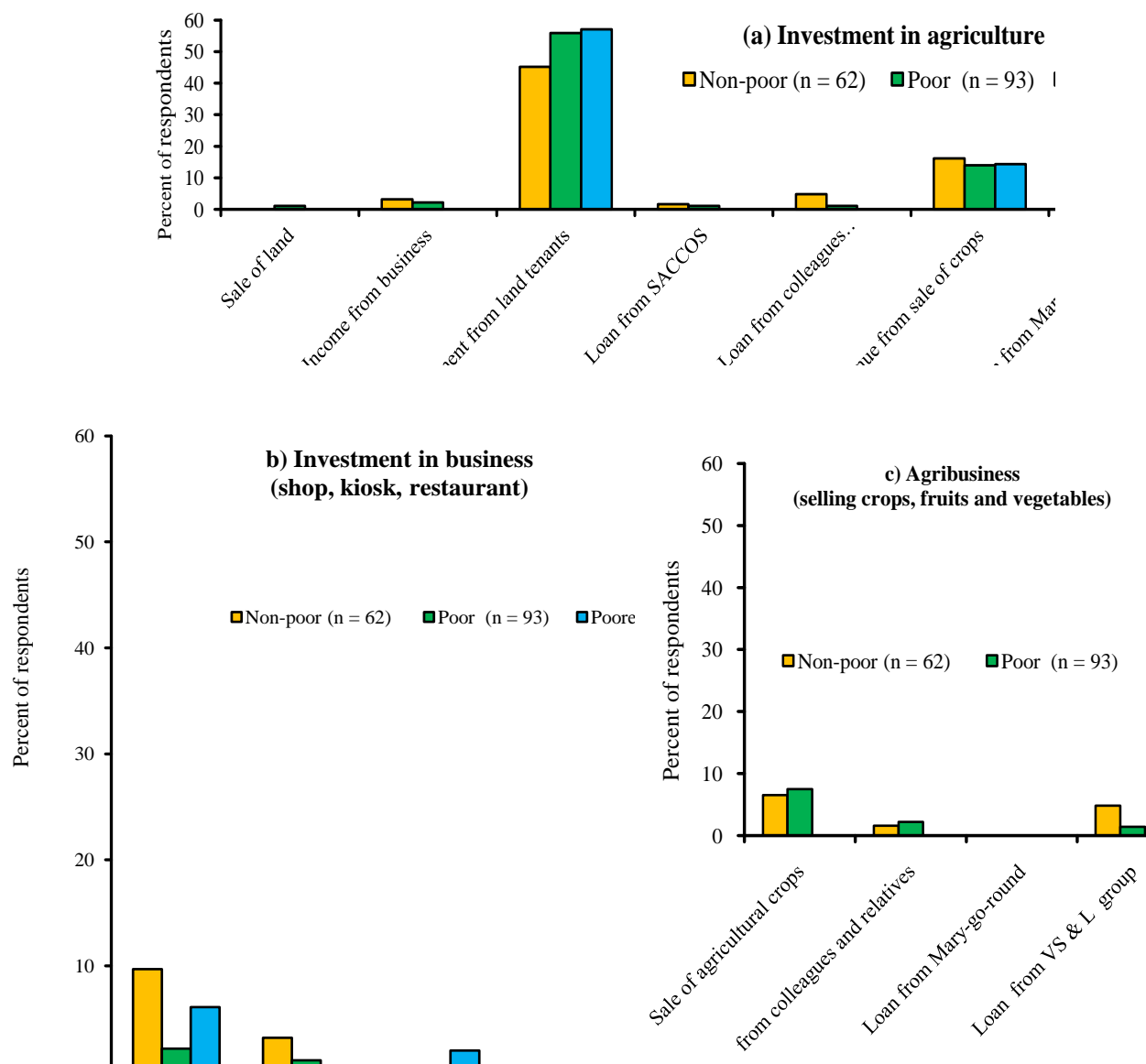
Figure 3: Responses on sources of investment capital for agriculture (a), business (b), and sale of agricultural crops by wealth categories in Lugeni, Mangala, Tandai, and Tandali villages in the Uluguru Mountains of Morogoro, Tanzania

The proportions of those who sold land (to their fellow community members) for investment capital were 64.8%, 58.5%, and 51.0% in Mangala, Lugeni, and Tandali villages respectively. On the other hand, the proportion of respondents who relied on loans from SACCOs for investment capital for business was significantly higher in Tandai, with 6.5% of the respondents relying on loans from SACCOs versus zero for the remaining villages.

(a) Investment in agricul

Percebt of respondents

- Lugeni (n = 53)
- Mangala (n = 54)
- Tandai (n = 46)

Sources of investment capital

Sale of land | Income from business | Payment from land tenants | Loan from SACCOs | Loan from colleagues and… | Revenue from sale of crops | Loan from '

b) Investment in bu (shop, kiosk, restau

Percent of respondents

- Lugeni (n = 53
- Mangala (n = :
- Tandai (n = 46
- Tandali (n = 5

c) Sale of agricultural cro

Percent of respondents

- Lugeni (n = 53)
- Tandai (n = 46)

Figure 4: Variation among villages in their responses on sources of investment capital for agriculture (a), business (b), and sale of agricultural crops in Lugeni, Mangala, Tandai, and Tandali villages in the Uluguru Mountains of Morogoro, Tanzania

Another notable feature was the use of loans from colleagues and relatives for investment in the sale of agricultural crops recorded in Tandali village, as reported by 5.6% of the respondents compared to none in the rest of the villages. Although only to a small extent and with no statistical significance, there was also a notable reliance on loans from VS & L groups for

investment in the sale of agricultural crops, as reported by 3.8% and 2.0% of respondents in Lugeni and Tandali villages respectively, versus no reports from the rest of the villages. Available records show that Lugeni was the only village among the studied villages in which VS & Ls had been introduced through the Uluguru Mountain Environmental and Conservation Project (URT, 2010b). In terms of proximity, Tandali is relatively close to Lugeni, which could mean that a spillover effect had happened leading to the expansion of VS & Ls to Tandali village.

7.3.3 Household Incomes and their Sources

A general linear model multivariate analysis of the income data using wealth category as a fixed factor revealed significant variation ($p < 0.05$) in mean annual household incomes from agriculture, business, the sale of agricultural crops, and mean total annual household income (**Figure 5**).

For all the sources of income examined, the non-poor had a significantly higher mean annual income than the poor and poorest. In terms of the contribution of individual sources of income, agriculture and business were almost equally important for the non-poor, contributing 36% and 39% of the mean total annual income respectively. In contrast, agriculture was the most important source of income for the poor and poorest.

Agriculture contributed 84% and 91% of the mean total annual incomes for the poor and poorest respectively. The pattern of contribution of the various income sources observed in this study conforms to that reported by Ellis and Mdoe (2003) and URT (2008) in the same area and in other rural areas in Tanzania. Heavy reliance of the poor and poorest on agriculture is an indication of less diversification, which could mean more vulnerability given the fact that agriculture is the most vulnerable sub-sector compared to other income portfolios (Ellis and Mdoe, 2003; Ellis and Allison, 2004).
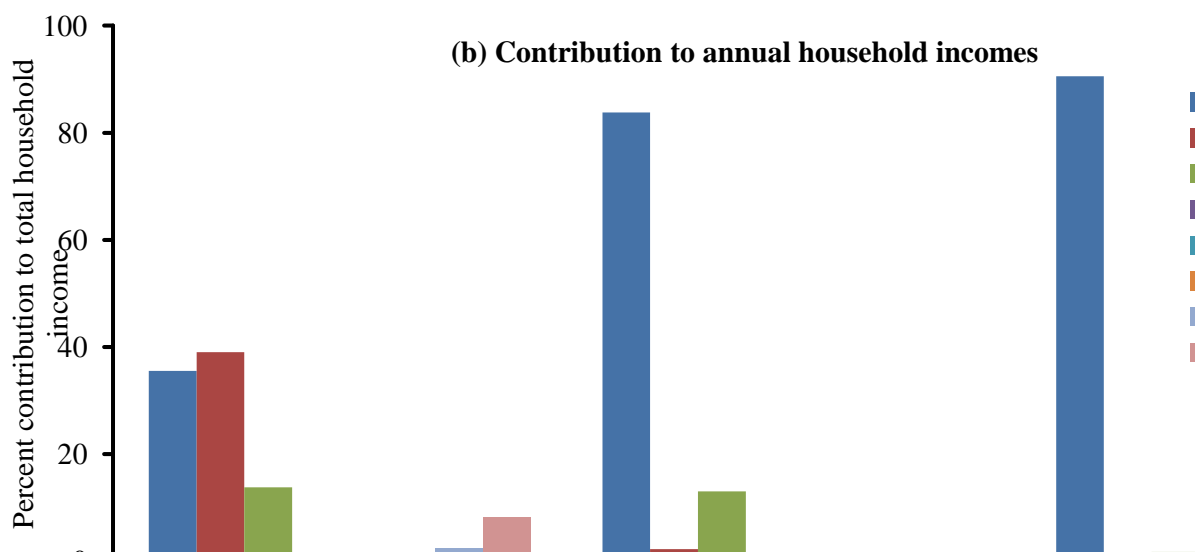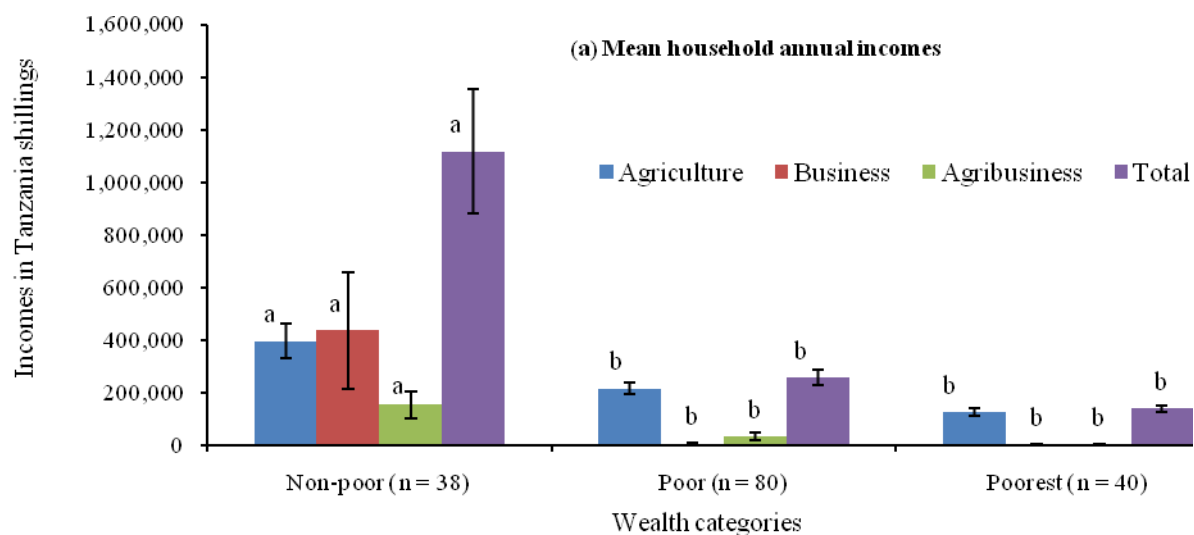
Figure 5: Variation in mean household annual incomes from the major livelihood activities among wealth categories (a), and contribution of different livelihood activities to the mean annual incomes (b) in Lugeni, Mangala, Tandai, and Tandali villages in the Uluguru Mountains of Morogoro, Tanzania

Within each category of livelihood activity, means for household incomes marked by the same letter are not statistically different at the 5% level of statistical significance according to a Least Square Difference (LSD) test of the General Linear Model (GLM) of the multivariate procedure of SPSS. Vertical bars indicate standard errors of means.

7.4   Access to Microfinance Services

Community engagement with MF institutions is one of the necessary conditions to ensure the availability of capital for investment in various livelihood activities (URT, 2010a). Recognizing the fundamental role of MF services in enhancing communities' efforts to move out of poverty, this study made an effort to investigate the MF institutions accessed by the respondents. Overall, access to financial services was limited across the surveyed villages since less than 20% of the respondents reported receiving loans from any MF institutions (**Table 5**).

Table 5: Percentage of respondents with access to loans from financial institutions in the study villages in the Uluguru Mountains of Morogoro, Tanzania

Financial institutions	Percent of respondents accessing loans					Chi-square statistics
	Tandai (n = 46)	Mangala (n = 54)	Tandali (n = 51)	Lugeni (n = 53)	**Overall (n = 204)**	
SACCOs	26.1	0.0	2.0	0.0	**6.4**	$\chi^2 = 38.991$; df = 3; p = 0.000
VS & Ls	0.0	0.0	17.6	30.2	**12.3**	$\chi^2 = 31.198$; df = 3; p = 0.000

In the surveyed villages, no one had access to formal financial institutions such as banks. Instead they depended only on SACCOs and VS & Ls, which represent credit unions (or semi-formal MF) and informal MF respectively. There was a statistically significant geographical divide between the coverage of the two MF services. SACCOs were more ubiquitous in Tandai village (26.1% of respondents) in Kinole ward ($\chi^2 = 38.991$; df = 3; p = 0.000) and VS & Ls were more common in Lugeni village (30.2% of respondents) in Mtombozi ward ($\chi^2 = 31.198$; df = 3; p = 0.000). It is interesting to note that VS & Ls were the more widely accessed MF institution in comparison with SACCOs, reaching 12.3% of the respondents against 6.4% reached by SACCOs. However, in all villages the poorest to a large extent, and the poor to a smaller extent, were consistently excluded from accessing loans from either of these MF institutions.

Results showed a highly statistically significant association between wealth category and access to loans from both SACCOs ($\chi^2 = 5.766$; df = 2; p = 0.016) and VS & Ls ($\chi^2 = 5.937$; df = 2; p = 0.015) (**Figure 6**).
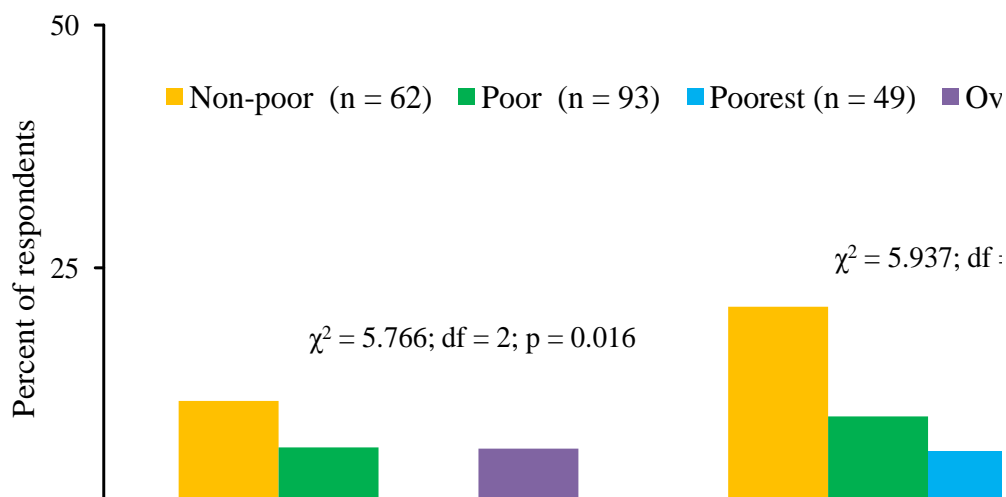
Figure 6: Percentage of respondents with access to loans from different MF institutions by wealth category in the study villages in the Uluguru Mountains of Morogoro, Tanzania

The proportion of respondents who reported accessing loans from SACCOs was 11.3% for the non-poor and 6.5% for the poor wealth categories versus zero for poorest. The proportion of respondents who reported having access to VS & Ls was 21.0% for the non-poor, 9.7% for the poor, and 6.1% for the poorest wealth categories. From these results it is clear that VS & Ls were the only MF institution that provided loans to the poorest, though this was only to a small extent. This may suggest that, to the extent these results may be representative of the reality, SACCOs as a source of MF services are more discriminatory against the poorest compared to VS & Ls.

7.5   Contribution of MF Services to Business Creation and Employment

Overall, out of 204 respondents only 64 (31.4%) reported being engaged in various IGAs (**Figure 7**). There was a highly statistically significant association ($\chi^2 = 11.184$; df = 2; p = 0.004) between wealth category and engagement in IGAs, which included sale of labour among the poor. The proportion of respondents engaged in IGAs was significantly highest and lowest for the non-poor and poorest wealth categories respectively. Of the 64 respondents who were engaged in IGAs, those from the non-poor wealth category accounted for 26 out of 62 (46.8%),

those from the poor category accounted for 26 out of 93 (28.0%), and among the poorest they accounted for 9 out of 49 (18.4%).
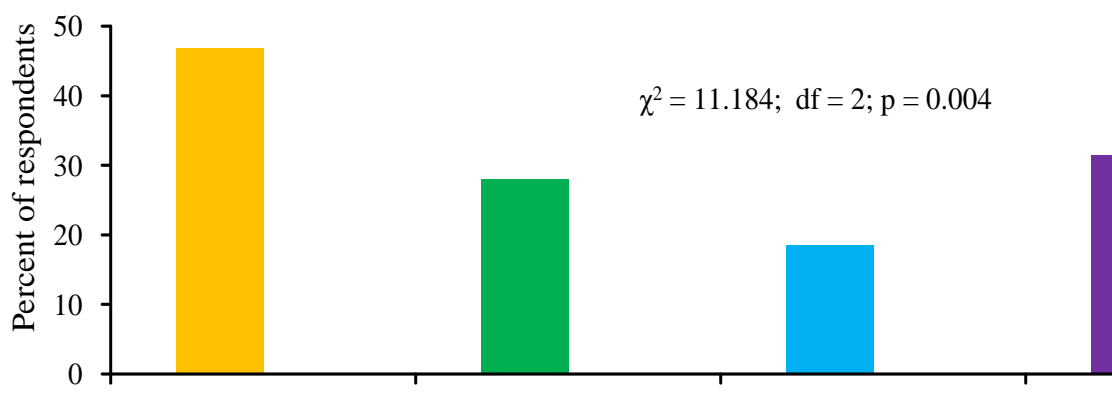
Figure 7: Percentage of respondents who reported participating in various income-generating activities by wealth category in the Uluguru Mountains of Morogoro, Tanzania

This study also investigated dynamics in IGAs in each wealth category. Overall, when asked whether they had changed IGAs over the last 10 to 15 years, of the 64 respondents participating in IGAs only 10 (15.6%) reported changing their IGAs, against 54 (84.4%) who reported not changing their IGAs. Data disaggregation by wealth category revealed no statistical association ($\chi^2 = 0.198$; df = 2; p = 0.906) between wealth category and change in types of IGAs. Among those who reported changing their IGAs, there were 5 out of 29 in the non-poor category (17.2%), 4 out of 26 poor (15.4%), and 1 out 9 in the poorest category (11.0%). However, the results showed a significant statistical association ($\chi^2 = 4.766$; df = 1; p = 0.029) between access to loans from MF institutions and changes in IGAs. Of the 10 respondents who reported changing their IGAs over the last 10 to 15 years, 7 (70%) had accessed loans from MF institutions.

The association between access to loans from MF institutions and changes in IGAs observed in this study conforms to the small but growing and widely accepted generalization that access to loans from MF promotes the creation of new business enterprises (Littlefield et al., 2003; Kessy and Urio, 2006).

7.6 Contribution of MF Services to Environmental Conservation

7.6.1 Access to MF Services and Attitude to Environmental Conservation

Overall, the attitude to environmental conservation was positive in the surveyed villages, with more than 80% of the respondents reporting a highly positive attitude. Results did not reveal any significant association ($\chi2 = 3.166$; df $= 4$; p $= 0.075$) between levels of attitude to environmental conservation and the type of MF institution accessed, and/or access to any MF (**Table 6**).

Table 6: Percentage distribution of respondents on attitude to environmental conservation by status of access to MF institutions in the Uluguru Mountains of Morogoro, Tanzania

Access to microfinance institutions	Levels of attitude to environmental conservation			Total
	Weak positive attitude	Moderate positive attitude	Highly positive attitude	
Beneficiaries of SACCOs (n = 13)	0.0	7.7	92.3	**100.0**
Beneficiaries of VS & Ls (n = 25)	0.0	4.0	96.0	**100.0**
Non-beneficiaries (n = 166)	1.2	17.5	81.3	**100.0**
Overall (n = 204)	**1.0**	**15.2**	**83.8**	**100.0**
Linear-by-linear association chi-square value	3.166			
Degrees of freedom	4			
Significance	0.075			

However, the proportion of respondents scoring a highly positive attitude to conservation tended to be higher and similar for beneficiaries of both VS & Ls (96.0%) and SACCOs (92.3%) than for non-beneficiaries (81.3%). Also, a few respondents (1.2%) who had not received any MF services scored a weak positive attitude, in comparison with no one from those who had accessed MF services. Overall, the positive attitude to environmental conservation is slightly higher compared to the situation previously recorded in the same area (FBD, 2008). The increase in the proportion of people with positive attitudes towards conservation could be a result of conservation and environmental information and education packages that were tailored to the MF services promoted in the Uluguru Mountains (URT, 2009; URT, 2010b).

7.6.2 Access to MF Services and Adoption of Environmental Conservation Practices

In terms of the participants' use of environmental conservation practices, the results showed a significant association between wealth category and use of contour farming as one of the

classical environmental conservation practices introduced in the area. The non-poor (17.7%) were more likely to practice contour farming than the poor (7.7%) and the poorest (0.0%) (**Table 7**). Nonetheless, there was no statistical association between wealth category and the rest of the farming practices known to enhance environmental conservation.

Table 7: Percentage distribution of respondents on use of environmental conservation practices by wealth category in the Uluguru Mountains of Morogoro, Tanzania

Environmental conservation practices	Percentage of respondents by wealth category‡				Statistics from chi-square test of association		
	Non-poor (n = 62)	Poor (n = 93)	Poorest (n = 49)	**Overall (n = 204)**	Linear-by-linear association value	Degrees of freedom	Significance
Terraces	21.0	33.0	18.8	25.9	0.007	2	0.934
Tree planting	64.5	52.1	47.9	57.2	3.013	2	0.083
Contour farming	17.7	7.7	0.0	9.0	10.633	2	0.001
Intercropping trees/shrubs with crops	50.0	37.4	41.7	42.3	0.965	2	0.326
Natural fallow	80.6	72.5	66.7	73.6	2.781	2	0.095
Crop rotation	59.7	50.5	54.2	54.2	0.427	2	0.513

‡The percentages do not add up to 100, and in some cases may actually exceed 100 due to multiple response effect

Similarly, beneficiaries of MF institutions who happened to be predominantly non-poor were more likely to practice terracing (39.5%), contour farming (26.3%), and crop rotation (71.1%) than non-beneficiaries, who recorded 22.7%, 4.9%, and 50.3% respectively (**Table 8**).

It is worth noting that the significant variations in use of environmental conservation practices among wealth categories, as well as among beneficiaries and non-beneficiaries of MF institutions, were only evident for alien practices (terracing and contour farming) but not for indigenous environmental conservation practices (natural fallow, crop rotation, and tree planting, including intercropping).

Table 8: Percentage distribution of respondents on use of environmental conservation practices by status of access to MF services in the study villages in the Uluguru Mountains of Morogoro, Tanzania

Environmental conservation practices	Percentage of respondents by status of participation in MF‡			Statistics from chi-square test of association		
	Beneficiaries (n = 38)	Non-beneficiaries (n = 166)	**Overall (n = 204)**	Linear-by-linear association value	Degrees of freedom	Significance
Terracing	39.5	22.7	**25.9**	4.521	1	0.033
Tree planting	68.4	54.6	**57.2**	2.404	1	0.121
Contour farming	26.3	4.9	**9.0**	17.322	1	0.000
Intercropping trees/shrubs with crops	52.6	39.9	**42.3**	2.054	1	0.152
Natural fallow	84.2	71.2	**73.6**	2.701	1	0.100
Crop rotation	71.1	50.3	**54.2**	5.343	1	0.021

‡The percentages do not add up to 100, and in some cases may actually exceed 100 due to multiple response effect

Ironically, there was no significant variation among wealth categories with respect to the extent of their engagement in practices considered to threaten environmental conservation. Results for use of practices considered to be destructive to the environment are presented in **Table 9.**

As expected (FBD, 2008), the use of fire for land preparation was the major threat to environmental conservation in the studied villages. As opposed to miombo woodland vegetation, which is adapted to recurrent fires (Chidumayo, 1997), mountain forests like those in the study area are sensitive to fire (FBD, 2002). This means that the use of fire in land preparation threatens the environment as the fire is likely to culminate in accidental wildfires that tend to be excessively destructive, given the nature of the ecosystem in the Uluguru Mountains.

There was no significant variation among wealth categories in the use of fire in land preparation ($\chi^2 = 0.009$; df = 2; p = 0.925). This means that even though the non-poor did practice some environmental conservation practices, they were still among the culprits of environmental degradation. Taken in totality so far, these results could mean that by not practicing environmental conservation, the majority of the poor and poorest were the ones responsible for environmental degradation in the studied villages. However, this may be more attributable to policy and market failure than poverty per se.

Table 9: Percentage distribution of responses on use of environmentally destructive practices by wealth category in the study villages in Uluguru Mountains of Morogoro, Tanzania

Environmental conservation practices	Wealth category				Statistics from chi-square test of association		
	Non-poor (n = 62)	Poor (n = 93)	Poorest (n = 49)	**Overall (n = 204)**	Linear-by-linear association value	Degrees of freedom	Significance
Use of fire for land preparation	71.0	64.8	70.8	68.2	0.009	2	0.925
Use of chemical fertilizers	0.0	0.0	0.0	0.0	0.0	2	-
Use of pesticides	1.6	0.0	0.0	0.5	1. 596	2	0.207

Access to environmental conservation information and education is likely to influence the adoption of alien environmental conservation practices (FBD, 2002, 2008). Thus, the study investigated levels of awareness of environmental conservation practices among different wealth categories and the reasons behind these levels. Results about the respondents' awareness of environmental conservation practices and sources of environmental conservation information and education are presented in **Figure 8** and **Table 10**, respectively.

$\chi^2 = 5.532$; df = 2; p =
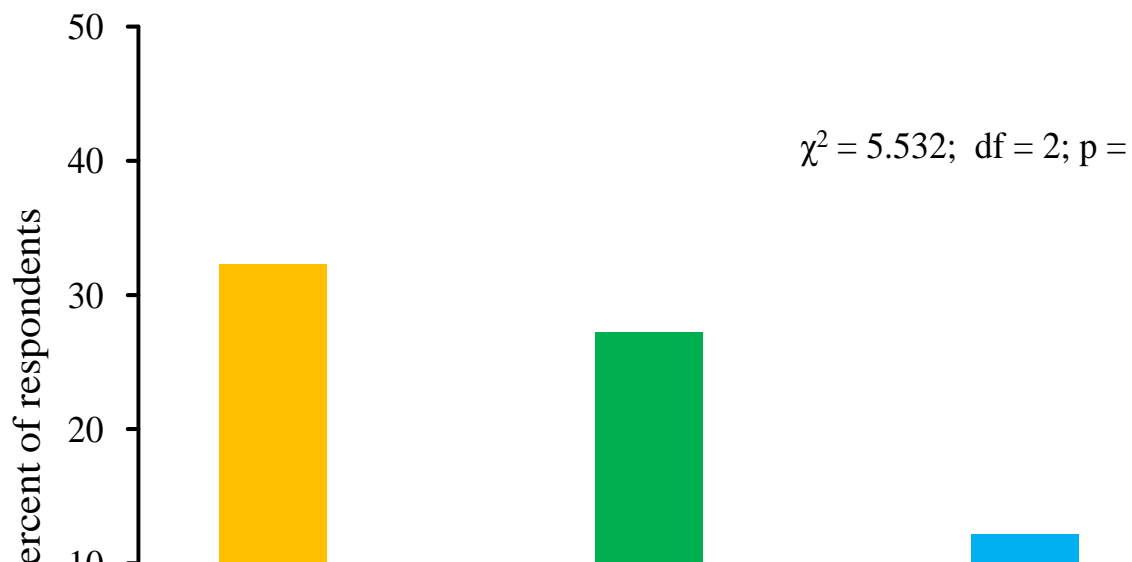
Figure 8: Percentage distribution of respondents on awareness of environmental conservation practices by wealth category in the study villages in the Uluguru Mountains of Morogoro, Tanzania

Overall, awareness of environmental conservation practices was generally low in the surveyed villages, with only 51 out of 204 respondents (25.1%) reporting being aware of environmental conservation practices. Those who reported being aware were asked to specify their sources of environmental conservation information and education. Their responses are presented in **Table 10**.

Out of the 51 respondents who reported being aware of environmental conservation practices, 3 (1 and 2 respondents from the non-poor and poor wealth categories respectively) did not remember the sources from which they had acquired the environmental conservation education.

Overall, farmer-to-farmer contact was the major means through which environmental information or education was accessed in the surveyed villages. Significant variation ($\chi^2 = 5.532$; df = 2; p = 0.019) among wealth categories was evident in their sources of environmental conservation information or education. The proportion of respondents who reported accessing environmental conservation information or education through farmer-to-farmer contacts was higher (100%) for the poorest wealth category and lower for the non-poor (42.1%) and poor (62.5%) categories.

Table 10: Percentage distribution of responses on sources of environmental conservation information and education by wealth category in the study villages in the Uluguru Mountains of Morogoro, Tanzania

Sources of environmental conservation information and education	Percent of respondents by wealth category				Statistics from chi-square test of association		
	Non-poor (n = 19)	Poor (n = 23)	Poorest (n = 6)	**Overall (n = 48)**	Linear-by-linear association value	Degrees of freedom	Significance
Farmer-to-farmer contacts	42.1	65.2	100.0	60.4			
Learning at school	15.8	13.0	0.0	12.5			
Past conservation projects	26.3	17.5	0.0	18.8	4.498	6	0.034
Extension officers from the district council	15.8	4.3	0.0	8.3			
Total	**100**	**100**	**100**	**100**			

Conversely, the proportions of respondents who were dependent on other alternative sources of environmental conservation information or education – namely, learning from school, past conservation projects, and extension workers from the District Council – were highest in the non-poor wealth category, medium in the poor wealth category, and zero in the poorest wealth category (**Table 10**).

The foregoing reasoning implies that the failure of development workers, such as extension workers from both government and non-government organizations, to deliver environmental conservation information or education to the poor and poorest is an underlying cause of the failure of these two wealth categories to adopt environmental conservation practices. Thus, unless proactive measures are taken to ensure access to environmental conservation information or education for the poor and poorest, we should not expect them to adopt introduced environmental conservation practices at the same rate as the non-poor, who are exceptionally privileged in being able to access the necessary environmental conservation information/education.

7.7 Access to Microfinance Services and Impacts on Poverty

7.7.1 Determinants of Access to Microfinance Services

A logistic regression analysis was conducted to ascertain socio-economic factors that influence access to MF services from both VS & Ls and SACCOs. Access to MF services as a dummy variable was regressed on age, education level (dummy variable), wealth categories (dummy variable), household size, proximity to financial institutions, land/farm size, and respondent's gender (dummy variable). A summary and the detailed results of the logistic regression analysis are presented in **Table 11** and **Appendix 3** respectively.

Of the predictor variables tested, household size, land/farm size, wealth category (being non-poor, poor, or poorest), gender (being a male), and education level (having a primary or secondary education) all had a positive influence on access to MF services. However, the influence of all these factors was not statistically significant ($p > 0.05$.

Table 11: Summary results of logistic analysis of the factors determining access to MF services by respondents, using data from the study villages in the Uluguru Mountains of Morogoro, Tanzania

Variable name	Coefficients	Standard error	z	Significance P> |z|
Age	-0.0414856	0.0196682	-2.11	0.0352[*]
Household size	0.0032191	0.119408	0.03	0.978
Distance to MF	-0.2295982	0.1070416	-2.14	0.032[*]
Land size	0.0398939	0.0677478	0.59	0.556
Wealth category (Non-poor/less poor)	1.718943	0.8879613	1.94	0.053
Wealth category (poor)	0.9079666	0.8512006	1.07	0.286
Gender (female)	-0.627766	0.5822377	-1.08	0.281
Education level (illiterate)	-.04980719	1.626852	-0.31	0.759
Education level (primary)	0.0999388	1.495177	0.07	0.947
Constant	0.0185335	1.744075	0.01	0.992

Source: Field Survey data, 2012; Note: [*]Significance at 5%

In addition, age, distance/proximity to MF institutions, gender (being a female), and lack of education all had a negative influence on access to MF services from both formal and informal institutions (**Table 11**). The influence was statistically significant ($p < 0.05$) for age and proximity to MF services but non-significant ($p > 0.05$) for the remaining factors.

7.7.1.1 Age

Results reveal that age has a negative but significant relationship with access to MF services. This suggests that within the age limits considered in our sample, older people have limited chances of accessing MF services from both formal and informal financial institutions. This is in line with findings by Mohamed (2003) who also found a negative relationship between access to MF services and age.

7.7.1.2 Gender

Relationship between gender and access to MF services was not significant and had a negative coefficient, suggesting that men were more likely to access MF services than women.

7.7.1.3 Education Level

The relationship between education level and access to MF services was also not significant. However, formal education levels had positive coefficients, whereas having no formal education negatively influenced access to MF. The implication of these results is that people who have attained formal education tend to access MF more than those without formal education, although not to a large extent.

7.7.1.4 Wealth of the Respondent

The test revealed that the respondent's wealth status has an influence on access to MF services. Non-poor and poor people were more likely to access financial services from MF compared to the poorest category. It is worth noting that being in the poorest wealth category had negative/or prohibitive effects on access to financial services from MF. This implies that the studied MF strategies are less likely to reduce poverty due to their discriminative nature towards the poor, although this is unusual since MFs are ostensibly established to help the poor move out of poverty.

7.7.1.5 Land or Farm Size

Farm size had a positive relationship with access to MF services. Also, size of landholding was mentioned as one of the wealth indicators in the study area: the larger the size of land owned the higher the wealth category. This might suggest a high possibility that credits secured from financial institutions have been invested in farming activities.

7.7.1.6 Location

Results revealed a significant relationship between proximity to MF institutions and one's chances of accessing services from formal and informal MFs. This suggests that being closer to financial institutions increases awareness of the services provided by the institutions. Thus the philosophy of locating MF services closer to the poor is one appropriate step in ensuring access to the services. However, for the poor to take full advantage of MF, proactive measures must be taken to remove all the procedural obstacles that prevent them from accessing the services.

7.7.2 Impacts of Access to MF Services on Income Poverty and Environmental Conservation

Results in **Table 12** show a significantly high relationship between average annual household income (t = 3.992; p < 0.000) and proportion of land under conservation agriculture (t = 2.696; p < 0.000) for MF beneficiaries compared to non-beneficiaries. Average annual household income for MF beneficiaries was three times higher than that of non-beneficiaries. On the other hand, the proportion of land under conservation agriculture was 27% and 12% for microfinance beneficiaries and non-beneficiaries respectively.

There are two possible explanations for the observed differences in incomes between MF beneficiaries and non-beneficiaries. First, it is possible that MF beneficiaries used the credits from MF to generate more income. Second, it is possible that those who had higher incomes before were the ones who managed to access MF.

Table 12: Results of t-test for differences between microfinance beneficiaries and non-beneficiaries for selected variables, using data from the study villages in the Uluguru Mountains of Morogoro, Tanzania

Variable	Respondents' category	Mean	Mean difference	t-value	Sig. (2-tailed)
Annual household income	MF beneficiaries	970 285.71	$652\,360.90^{***}$	3.992	0.000
	Non-beneficiaries	317 924.81			
Total land area owned	MF beneficiaries	4.0608	0.83597^{ns}	1.343	0.181
	Non-beneficiaries	3.2248			
Total area under conservation agriculture	MF beneficiaries	2.6029	0.82794^{ns}	1.868	0.068
	Non-beneficiaries	1.7750			
Proportion of land under conservation agriculture	MF beneficiaries	0.27072	0.14906043^{**}	2.696	0.008
	Non-beneficiaries	0.12146			
Total land rented in	MF beneficiaries	1.0556	0.15657^{ns}	-0.710	0.482
	Non-beneficiaries	1.2121			

The latter is supported by results from this study that revealed a significant statistical association (linear-by-linear chi-square: value = 12.664; df = 1; p = 0.000) between participation in MF and wealth category (**Figure 9**).
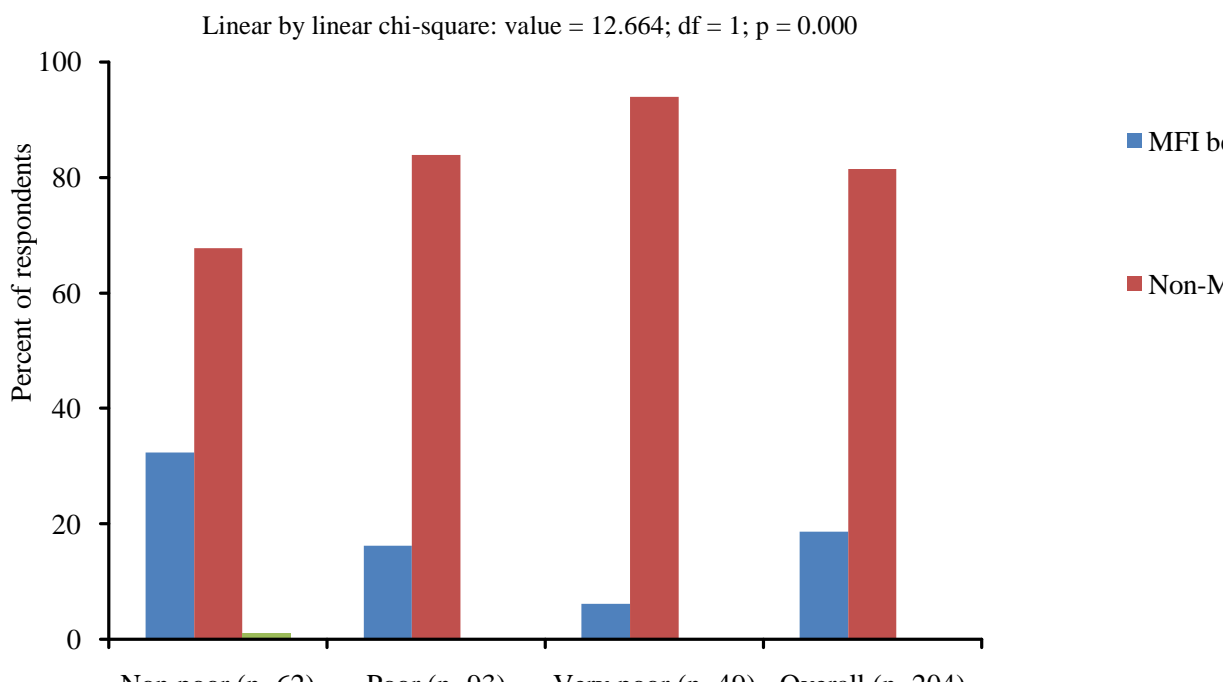
Figure 9: Percentage distribution of MF beneficiaries and non-beneficiaries by wealth categories in the study villages in the Uluguru Mountains of Morogoro, Tanzania Respondents from non-poor households were more likely to participate in MF than those from the poor or poorest wealth categories. Out of the 49 poorest respondents, only 6.1% were beneficiaries of MF institutions compared to 32.3% of the non-poor. Apparently, the non-poor are expected to have higher incomes than their poor and poorest counterparts because the former have access to more production opportunities than the other categories.

8.0   CONCLUSION, POLICY IMPLICATIONS AND RECOMMENDATIONS

8.1   Conclusion

By and large, the empirical evidence from this study suggests that community members in the studied villages have limited access to microfinance services as they entirely depend on member-based MF, either SACCOs (semi-formal MF institutions) or a VS & L (an informal MF institution), but not on formal MF or banks. Moreover, the proportion of respondents accessing credit from the available MF service providers was very low (less than 20% of respondents), which represents an untapped opportunity for the provision of investment capital in rural areas as one of the necessary conditions for poverty reduction. The limited access to credit from MF institutions was particularly pronounced among the poor and poorest; this resulted in the exclusion of the poor and poorest, for whom the MF institutions are ostensibly established in order to help them move out of poverty. Furthermore, it was evident that the few poorest who accessed credit did so from a VS & L but not from SACCOs, suggesting that, to the extent these results may be representative of the reality, SACCOs as a MF model are more discriminatory to the poorest compared to VS & Ls.

Although this study found a strong statistical association between changes in the type of income-generating activities (namely petty business, the sale of local beer, restaurants, trading in agricultural crops, trading of livestock meat, kiosks, and shops) and access to loans from MF, there was no evidence of increased diversity in IGAs among households, suggesting that access to MF services created new businesses at the expense of old ones and therefore resulted in no net additional employment opportunities.

The empirical evidence from this study suggests that access to proper extension services, rather than MF or level of poverty, determines attitudes towards environmental conservation and ultimately engagement in or refraining from environmentally destructive activities such as the use of fire in land preparation. Therefore, the failure of the poor and poorest to adopt environmental conservation practices is best explained by underlying problems inherent in overall market and policy failures that exclude the poor and poorest. This proposition is

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supported by the fact that the use of selected alien farming practices perceived to enhance environmental conservation was associated more with beneficiaries of MF institutions than with non-beneficiaries. On the other hand, participation in MF did not influence the use of indigenous farming practices known to conserve the environment. Furthermore, it was evident that those who used the alien farming practices for environmental conservation were those who had received training in the same. Market and policy failures mean that the poor and poorest are excluded from various forms of training that entail access to necessary information about the alien conservation practices. Without access to such information the poor and the poorest, as well as non-beneficiaries of MF institutions, cannot be expected to adopt the practices in the same way as the non-poor.

8.2   *Policy Implications*

The study has shown the potential of microfinance to help people move out of poverty through the provision of capital for investment in productive activities and enhancing livelihood diversification. However, the institutional requirement, pertinent to both VS & Ls and SACCOs, that members must contribute upfront shares before they are allowed to borrow has constrained the poor and poorest from taking full advantage of MF as an opportunity to move out of poverty. Similarly, although the poor and poorest are seen as the culprits of environmental degradation, the underlying cause of their inability to adopt environmental conservation practices is the failure of existing extension approaches to harness the special needs of the poor and poorest. Based on these facts a number of policy implications are put forward:

a) Rural financial sector policy should not solely focus on a proliferation of MF but concurrently support an environment that enhances the access of the poor and poorest to the services provided by MF institutions. Understanding and addressing the barriers that prevent the poor from accessing loans from MF institutions should be a key element of ongoing efforts to extend financial services to rural areas.

b) For policies guiding financial sector development and organizations engaged in similar efforts, there is a need to shift the focus and approach to designing rural financial

development interventions, from seeing SACCOs as the principle MF service provider to including VS & Ls and other informal MF institutions that are more effective at reaching the poor and poorest. Thus, efforts meant to provide a better understanding of the dynamics of access to MF services from a broader perspective may be a key to achieving sustainable development.

c) Understanding and designing strategies to waive the requirement for the poor and poorest to contribute upfront shares before they are allowed to borrow is necessary to ensure that MF delivers effectively on its intended objective of helping the poor and poorest to take the opportunity offered by MF institutions, and therefore enhance their ability to move out of poverty.

d) Deploying extension workers in rural areas will not ensure that most households will automatically gain access to the needed extension services. The presence of extension workers in rural areas is a key factor, but it is not the only one. Difficulties in reaching the poor and poorest or a failure to understand the special needs and circumstances of the poor and poorest can substantially reduce the chances of engaging the poor and poorest in environmental conservation activities or of persuading them to refrain from activities that are destructive to the environment.

e) Paying attention to the effective engagement of the poor and poorest in environmental conservation may result in the need to re-assess the approaches and capacity of extension workers deployed to the rural areas to support agriculture and overall rural development. The complex relationship between the dynamics of environmental conservation and poverty reduction will need strong integration of specialized agencies and sector-based organizations involved in rural development such as microfinance institutions, and those involved in environmental conservation, in order to approach rural development in a more holistic manner and maximize the rate of success.

f) Finally, the provision of microfinance services needs to be undertaken without compromising the overall objective of building the capabilities of the poor and poorest.

8.3   *Recommendations*

Based on the results from this study the following practical recommendations are put forward:

(i).   To realize practical wealth creation and help rural people move out of poverty, the government and other development actors should give more emphasis to interventions that enhance agriculture productivity.

(ii).   Lack of initial capital to contribute shares for the membership-based MF institutions studied appears to be the major factor that hinders the participation of the poor and poorest. Thus, revising the member-based MF models to include fund-matching will allow the poor to access loans without being asked for upfront share contributions, which is likely to enhance access to MF services for the poor and poorest community members.

(iii). To encourage a wide adoption of environmental conservation practices, more emphasis should be given to participatory extension approaches, and identifying and addressing the inherent barriers that hinder the poor and poorest from accessing conservation education.

(iv).   To enhance the contribution of MF services to environmental conservation, appropriate environmental conservation education packages should be developed and integrated with MF institutions in rural areas.

(v).   VS & L as a MF model needs to be given priority over other MF models as it has been proven to be more effective at reaching the poor.

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Appendix 1: Summary statistics for association between wealth category and sources of income for investment in the major livelihood activities

Livelihood activities	Sources of investment in agriculture	Percent of respondents by wealth categories				Statistics on chi-square test of association		
		Non-poor (n = 62)	Poor (n = 93)	Poorest (n = 49)	Overall (n = 204)	Linear-by-linear association chi-square value	Degrees of freedom	Significance
Agriculture	Sale of land	0.0	1.1	0.0	0.0	0.008	2	0.931
	Income from business	3.2	2.2	0.0	2.0	1.431	2	0.232
	Loan from SACCOS	1.6	1.1	0.0	1.0	0.708	2	0.400
	Loan from colleagues and relatives	4.8	1.1	0.0	2.0	3.541	2	0.060
	Revenue from sale of crops	16.1	14.0	14.3	14.7	0.085	2	0.770
	Loan from Mary-go-round	0.0	1.1	0.0	0.5	0.008	2	0.931
Business (shop, kiosk, restaurant)	Sale of agricultural crops	9.7	2.2	6.1	5.4	0.936	2	0.333
	Loan from SACCOS	3.2	1.1	0.0	1.5	2.04	2	0.153
	Loan from colleagues and relatives	0.0	0.0	2.0	0.5	2.095	2	0.148
	Loan from VS & L group	3.2	0.0	0.0	1.0	3.262	2	0.071
Sale of agricultural crops	Sale of agricultural crops	6.5	7.5	0.0	5.4	1.927	2	0.165
	Borrowing money from colleagues and relatives	1.6	2.2	0.0	1.5	0.408	2	0.523
	Loan from VS & L group	4.8	1.4	0.0	1.5	4.918	2	0.027*

Appendix 2: Summary statistics for association between village and sources of income for investment in the major livelihood activities

Livelihood activities	Sources of investments in agriculture	Percent of respondents by villages				Statistics on chi-square test of association		
		Lugeni (n = 53)	Mangala (n = 54)	Tandai (n = 46)	Tandali (n = 51)	Pearson Chi-square value	Degrees of freedom	Significance
Agriculture	Sale of land	1.9	0.0	0.0	0.0	2.863	3	0.413
	Income from business	1.9	0.0	4.3	2.0	2.445	3	0.485
	Loan from SACCOS	1.9	0.0	2.2	0.0	2.163	3	0.539
	Loan from colleagues and relatives	1.9	0.0	2.2	3.9	2.112	3	0.549
	Revenue from sale of crops	11.3	13.0	21.7	13.7	2.468	3	0.481
	Loan from Mary-go-round	1.9	0.0	0.0	0.0	2.863	3	0.413
Business (shop, kiosk, restaurant)	Revenue from sale of crops	5.7	3.7	6.5	5.9	0.321	3	0.571
	Loan from SACCOS	0.0	0.0	6.5	0.0	5.945	3	0.015*
	Loan from VS & L group	1.9	0.0	0.0	2.0	1.562	3	0.211
Sale of agricultural crops	Revenue from sale of crops	9.4	0.0	4.3	3.9	0.001	3	0.972
	Loan from colleagues and relatives	0.0	5.6	0.0	0.0	0.721	3	0.396
	Loan from VS & L group	3.8	0.0	0.0	2.0	1.612	3	0.204

Appendix 3: Detailed Stata software outputs for logistic regression analysis of factors affecting access to microfinance in communities within Uluguru Mountains in Morogoro, Tanzania

```
Logistic regression                          Number of obs   =        157
                                             LR chi2(9)      =      40.47
                                             Prob > chi2     =     0.0000
Log likelihood = -53.379456                  Pseudo R2       =     0.2749
-------------------------------------------------------------------------
   daccfinse1 |     Coef.   Std. Err.      z    P>|z|    [95% Conf. Interval]
--------------+----------------------------------------------------------
          age | -.0414856   .0196682    -2.11   0.035   -.0800346   -.0029366
       hhsize |  .0032191    .119408     0.03   0.978   -.2308163    .2372544
      distfini | -.2295982   .1070416    -2.14   0.032   -.4393959   -.0198006
      totallan |  .0398939   .0677478     0.59   0.556   -.0928893    .1726771
   dcategory1 |  1.718943   .8879613     1.94   0.053    -.021429    3.459315
   dcategory2 |  .9079666   .8512006     1.07   0.286   -.7603559    2.576289
      dgender1 |  -.627766   .5822377    -1.08   0.281   -1.768931    .5133989
     deducatio1 | -.4980719   1.626852    -0.31   0.759   -3.686643    2.690499
     deducatio2 |  .0999388   1.495177     0.07   0.947   -2.830554    3.030431
         _cons |  .0185335   1.744075     0.01   0.992    -3.39979    3.436857
-------------------------------------------------------------------------

Logistic regression                          Number of obs   =        157
                                             LR chi2(7)      =      37.31
                                             Prob > chi2     =     0.0000
Log likelihood = -54.959515                  Pseudo R2       =     0.2534
-------------------------------------------------------------------------
   daccfinse1 |     Coef.   Std. Err.      z    P>|z|    [95% Conf. Interval]
--------------+----------------------------------------------------------
          age | -.0453043   .0187065    -2.42   0.015   -.0819683   -.0086403
       hhsize |  .0321724   .1154166     0.28   0.780   -.1940401    .2583848
      distfini | -.2452577   .1052221    -2.33   0.020   -.4514893   -.0390261
      totallan |  .0692774   .0639634     1.08   0.279   -.0560887    .1946434
   dcategory3 | -1.349837   .8030741    -1.68   0.093   -2.923834    .2241588
      dgender2 |  .5931188   .5629954     1.05   0.292   -.5103318    1.696569
     deducatio3 |  .0171555   1.493758     0.01   0.991   -2.910557    2.944868
         _cons |  .6330076   1.014541     0.62   0.533   -1.355455     2.62147
-------------------------------------------------------------------------
```