Effectiveness of Grassroots Institutions in Governing Land Management: A Case of the Uluguru Mountains, Morogoro, Tanzania

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Abstract

Unsustainable land management practices have been reported in the Uluguru Mountains, Tanzania. Literature points to a clear association between land management and institutions; it reveals a problem in terms of effectiveness of conservation by-laws and indicates lack of focus on informal institutions. It is not clear as to how effective are land-related institutions when combined. Often times, formal and informal institutions have been studied in isolation from one another. This paper assessed the effectiveness of formal and informal institutions in governing land management. Data were collected through household survey and semi-structured interviews. Institutional effectiveness, indicated by behavioural change, was measured using Likert scale. Multinomial logistic regression was used to analyse the influence of independent variables on institutional effectiveness. Content analysis was used to analyse qualitative data. Results showed that institutions are generally effective in governing land management in the Uluguru Mountains. Formal institutions were seen to be legally binding. Informal institutions, though they influenced land management behaviour, were associated with declining credibility among the Luguru people. Land ownership security, awareness of institutions and market access were significantly important conditions for institutional effectiveness and hence ought to be the policy priorities. They provide knowledge on, and incentives for adherence to rules and norms. Ecological concerns motivated compliance with prescriptions on land management. Thus, actions on land management are not guided by individual rationality (the logic of costs and benefits) alone; they are also guided by the social rationality (doing what is appropriate or expected by a given community). While it is important to invest in formulation and/or amendment of formal rules for land management as deemed necessary, it is equally important to promote the good aspects of informal institutions, i.e. practices, norms and beliefs, which enhance land management behaviour.

Keywords: Land management, Uluguru Mountains, Effectiveness, Institutions

Introduction

In Tanzania, particularly in mountainous areas, land degradation is a serious problem. For instance, in Lushoto, Mowo *et al.* (2011) reported degradation, deforestation and land fragmentation as major problems whereas in the Uluguru Mountains van Donge (1993) claimed that the land shortage and land degradation made it impossible for people to be self-sufficient in food. A number of cases of unsustainable land management practices have been reported in the Uluguru Mountains, notwithstanding the fact that the mountains are of global importance due to their richness in biodiversity and water resources. They include yearly occurrence of wild-land fires which result into loss of biodiversity, erosion of savings and household food insecurity (Mussa *et al.,* 2012), farming on steep slopes, usually above 55% gradient (Malisa, 2009), and cultivation up to the borders of the forest reserve and occasionally within the reserve (Hymas, 2000). Hella and Wamba (2019) assert that in the Uluguru Mountains many people have inhabited the hilly slope area for agricultural production. Increased pressure on the hilly slopes leads to

soil erosion and other forms of land degradation since the same farm size is required to support more people. Land degradation caused by soil erosion and other processes, such as leaching, and salinity are serious environmental threats that have drawn a lot of attention from both local and the international community (Hella & Wamba, 2019).

The failure of institutions and weak policy performances concerning how land (and related natural) resources are managed has been mentioned by Chigbu (2022) as the primary source of development challenges. In Tanzania, various causes have been given to explain land degradation occurring in Tanzania. They include widespread poverty which is exacerbated by population growth (Chamshama *et al.,* 2009; Hella & Wamba, 2019), inappropriate agricultural activities and encroachment of cultivation on fragile areas such as river tributaries, poor enforcement of conservation by-laws (Mahonge, 2010), and lack of some form of individual ownership as land considered as public property is liable to degradation (Katani, 2010). A study conducted in the Uluguru Mountains by Chamshama *et al.* (2009) indicated that groups and by-laws have an instrumental role in managing natural resources, and that there is lack of wide participation of stakeholders in the process of formulating by-laws, particularly at community level.

Suggesting a possible approach to ensuring land management, Dondeyne *et al.* (2003) contended that secure access to land, particularly secure land rights, are of prime importance for sustainable land management. The link between land rights and land management is explained by Katani (2010) who asserts that land tenure regulates behaviour on land use and management. Along the same line, literature indicates that there is an association between land management and institutions and that there is a problem with enforcement and hence effectiveness of conservation by-laws. It is also clear that much focus has been placed on formal rules and that even when informal institutions are studied, the two (formal and informal institutions) were studied in isolation from one another. This called for the need to investigate informal institutions along with the formal institutions with respect to their effectiveness and the conditions influencing their effectiveness.

As Vatn and Vedeld (2012) posit, no regime operates independently of existing institutions. They assert also that it is the sum of institutions that influences human action. It is from this context this study sought to assess the effectiveness of formal and informal grassroots institutions in governing land management. The main questions were: first, has there been notable behavioural change among the community members as a result of the institutions? and second, what are the conditions for institutional effectiveness?

In the context of this study, the definition of institutions by Helmke and Levitsky (2004) is operational. That is, institutions are rules and procedures (both formal and informal) that structure social interaction by constraining and enabling actors' behaviour. Formal institutions are rules and procedures that are created, communicated, and enforced through channels widely accepted as official. By contrast, informal institutions are socially shared rules, usually unwritten, that are created, communicated and enforced outside of officially sanctioned channels.

Conceptual Framework

The conceptual framework for this study is adapted from a framework for studying environmental governance systems developed by Vatn (2011), which is used to support the identification of relevant variables to explore. The study is based on assumptions of the theory of human action. Specifically, it embraces the social constructivist position in attempting to understand how institutions influence human behaviour and offer meaning to various situations.

From a social constructivist perspective, the theory entails that institutions are not just seen as constraints; they are also seen to influence the individual—the values and preferences an individual holds and what is considered right to do in certain situations (Vatn, 2011). That is, institutions are a human creation and human being is a product of the same institutions (Vatn, 2005). According to the theory, people act

on the basis of different kinds of rationalities in different contexts. It contrasts with the individualist position which sees institutions only as constraints within which the given individuals act and choose. According to Vatn (2015), those building on individualist position accept that institutions are formed by humans but do not see them as also forming people. The individualist perspective sees maximization of individual utility as the only rationality.

In the context of this study, institutional effectiveness is indicated by change in land management behaviour regulated by institutions. Land management entails soil erosion control, farmland fires control and farmland water sources conservation. Land management is influenced by formal and informal institutions through their influence on actors' behaviour (motivations, preferences and actions).

Borrowing from Ostrom (2011), attributes of the land, including the slope and scarcity or abundance, are also assumed to influence land management as they influence the actors' perceptions regarding the land. For example, with small land parcel the land owner, who in this case has limited access to land, may feel the need to employ land management practices so that the land can continue to be productive. Actors can as well formulate new institutions and/or amend existing ones depending on attributes of the land. In addition to the effect of land attributes, the influence of institutions on human behaviour may be affected by personal characteristics such as age, sex, education level and income; awareness of institutions and market access (Fig. 1). For instance, actors with higher education levels may have higher awareness of institutions thereby exercise higher compliance than those with lower education levels.

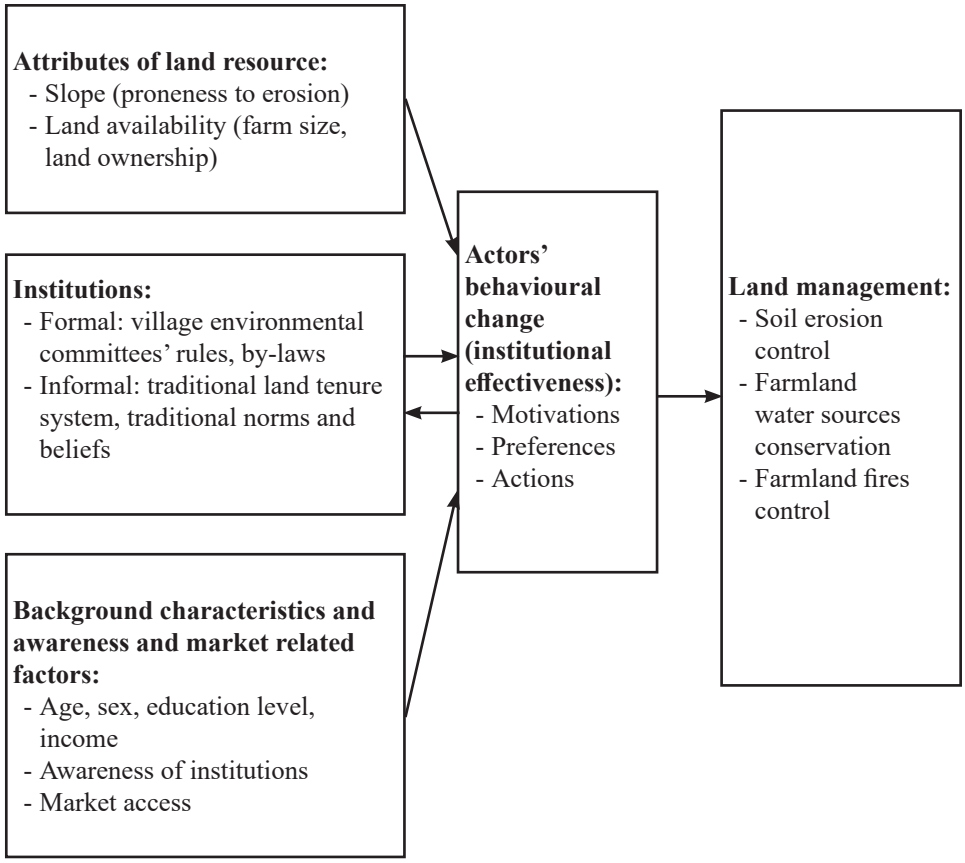

Figure 1: A conceptual framework for research on effectiveness of grassroots institutions for governing land management in the Uluguru Mountains
Source: Adapted from Vatn (2011)

Materials and Methods

Description of the Research Area

The study was conducted in the Uluguru Mountains, Morogoro Region, Tanzania (Fig. 2). The area is characterized by a mountainous and hilly landscape consisting of steep and deep valleys of slopes ranging between 10% and 100% (Kilasara & Rutatora, 1993). The landscape is the source of many streams, which join to form rivers. Among the big rivers to which the Uluguru Mountains contribute its tributaries is Ruvu River, which is the major source of water to people living along the river within Morogoro and Coast Regions and the city of Dar es Salaam. Due to favourable climate, cultivation of vegetables and fruits goes on all

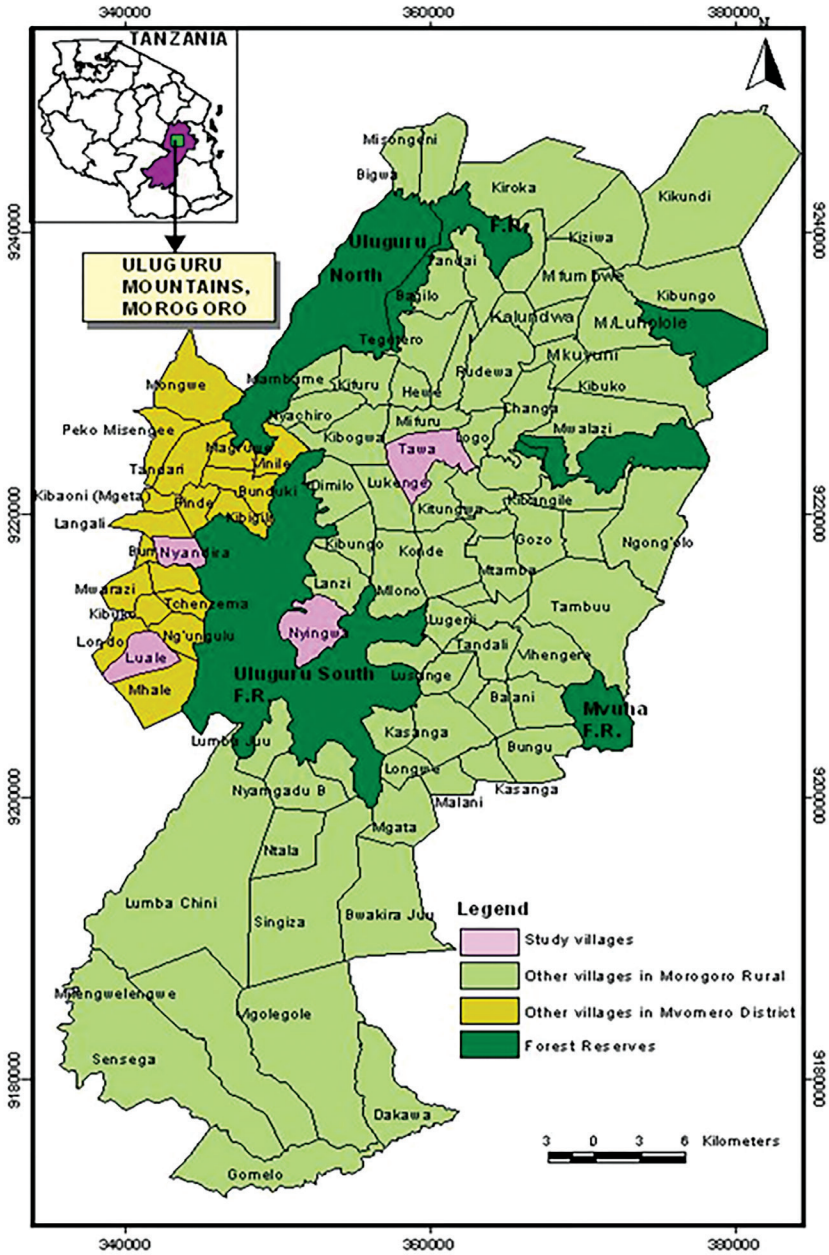

Figure 2: Map of Mvomero and Morogoro Districts showing the study area

year round suggesting the need for adoption of appropriate land management practices in order to sustain agricultural activities. Despite presence of various formal and informal institutions governing land management in the area, studies (example Hymas, 2000; Paulo *et al.,* 2007; Hella & Wamba, 2019) show that most communities in the landscape outside the forest reserve practise unsustainable agriculture.

Research Design, Sampling Procedure and Sample Size

The study used a cross-sectional design, and hence collection of data was done at a single point in time. The sampling process was carried out through multistage sampling procedure. In order to ensure geographical representativeness, stage one involved purposive selection of two divisions namely Matombo which is on the eastern side of the Uluguru Mountains and Mgeta which is on the western side. The two divisions have distinct agro-ecological characteristics and land management practices. According to UMADEP (2001), on the eastern side, the climate varies from tropical-humid to sub-tropical allowing cultivation of bananas and spices.

Agroforestry is commonly practised, with some farmers practising contour strip cropping as well. Except for Kikeo and Luale wards, which are semi-arid, the western side is mainly characterized by sub-tropical climate supporting production of temperate fruits and vegetables. Terracing and ridging are commonly practised in this area.

During the second stage, purposive sampling was used to select two wards from each division. In order to capture the diversity of institutions and conditions that are likely to influence institutional effectiveness, one ward was selected from fast growing trade centres—where people originating from different cultures are likely to inhabit and exchange of goods and services attract requisite institutions—and the other one from areas with limited interactions with people from outside the community. Based on the same criterion, one village was purposively selected from each ward. Stage three involved random selection of 45 farmers from each village, making a sample size of 180 for the whole study area for interviews. The decision to use this sample size was based on homogeneity of the study villages in terms of existing institutions and attributes of the land resource namely slope, availability and land tenure arrangements. Thus, a sample of 45 respondents per village which is big enough, and actually much bigger than the minimum recommended by Bailey (1994), that is, 30 cases for research in which statistical data analysis is to be done.

Data Collection

The study is primarily quantitative with qualitative approach included to achieve complementarity and for triangulation. Primary data were collected through a household survey, participatory rural appraisal (PRA), focus group discussions (FGDs) and key informant interviews. To reduce chances of misunderstanding the key informants, in each village the number of key informants was at least two. These were selected based on their positions in the community and/or knowledge on institutions and land management practices in the area. The key informants included matrilineal uncles, village leaders, government extension officers and farmers. In order to capture land management practices and their relationships with existing institutions, the FGDs and PRAs were composed of representatives of the village councils, village environmental management committees and farmers' groups. Religious leaders were also involved in the PRAs. In all cases, male and female members were represented since the views of these categories are not necessarily the same. Moreover, institutional enforcement may affect the two categories differently. Therefore, four PRA teams were formed, each with 10-12 participants including committee members, ordinary farmers, village leaders and religious leaders; 10 key informant interviews conducted and seven FGDs (at least one in each village) conducted, whereby each was composed of at least six participants, including leaders and ordinary members of committees, councils and representatives of farmers' groups. In all the groups, the proportion of women participants was around 30%, this being a result of the

deliberate efforts to ensure women participation, especially, where random selection would not guarantee their inclusion.

The household survey used a structured interview schedule. Interview checklists and structured interview schedule were pre-tested in Londo village, which is located on the western Uluguru Mountains. Secondary data including village by-laws, policies and interventions on land management in the Uluguru Mountains were collected from Uluguru Mountains Agricultural Development Project (UMADEP) and village offices during the field work and through internet search.

Measurements and Data Analysis

Measurements

Institutional effectiveness, indicated by behavioural change, was measured using a five-point Likert scale against three indicators of land management namely soil erosion control, farmland fire control and conservation of farmland water sources. Institutional effectiveness was conceived of as relative improvement caused by institutions when compared to the hypothetical situation that would have occurred in their absence. Eighteen Likert statements, nine with negative connotation and nine with positive connotation (Table 1), were formulated based on the indicators above and given scores ranging from one to five. Adoption of positive and negative items was meant to reduce acquiescence bias (Salazer, 2015). The scores reflected strongly agree, agree, neutral, disagree and strongly disagree for 5, 4, 3, 2 and 1 points in that order. The minimum of 18 points would be scored by one who would choose strongly disagree for all the 18 items, and the maximum of 90 would be obtained by someone who would choose strongly agree for all the 18 items.

Data Analysis

Qualitative data from key informant interviews, PRA and FGDs were analysed using content analysis, specifically the directed approach. As Hsieh and Shanon (2005) assert, the goal of the directed approach to content analysis is to validate or extend conceptually a theoretical framework or theory. In this regard, the many words of text transcribed from recorded information were compressed into fewer content categories resulting in synthesized meaning based on study objectives.

As for the quantitative data, all started with collapsing the five-point scale to three-point scale entailing agree, neutral and disagree. The opinion on institutional effectiveness was judged unfavourable when the overall mean was below the average (18-53), neutral when the mean was equal to average (54) and favourable when the mean was above the average (55-90). The analysis was done using the Statistical Package for Social Sciences (SPSS) and Microsoft Excel. Descriptive analysis was done by computing frequencies, means and minimum and maximum values of individual variables.

In order to determine the patterns of association that exist between institutional effectiveness and a set of variables assumed to affect the effectiveness of institutions, inferential statistical analysis was performed. In this regard, a multinomial logistic regression (MLR) model was developed and used to test the influence of nine independent variables, indicated in the model below, on institutional effectiveness. As Field (2009) asserts, MLR is used when the outcome (dependent) variable is categorical and consists of more than two categories (which cannot be ordered in any meaningful way) and the predictor (independent) variables are continuous and/or categorical. MLR is suitable for this research because the dependent variable (institutional effectiveness) has three categories (unfavourable opinion, neutral opinion and favourable opinion), while the independent variables are a mixture of nominal, ordinal and ratio variables. The MLR model used was specified as follows:

$$P(y) = \frac{e^{\alpha + \beta 1x1 + \beta 2x2 \ldots \beta kxk}}{1 + e^{\alpha + \beta 1x1 + \beta 2x2 \ldots \beta kxk}}$$

(Agresti & Finlay, 2009),

where:

P(y) = the probability of the success alternative occurring
e = the natural log
α = the intercept of the equation
β1 to βk = coefficients of the predictor variables
x1 to xk = predictor variables entered in the

regression model

In this research:

P(y) = 1 the probability of institutions being effective
x1 = age of respondent
x2 = total income
x3 = market access
x4 = farm size
x5 = sex
x6 = education level
x7 = slope of the farm plot
x8 = land ownership security
x9 = awareness of institutions

The analysis involved determining beta weights, Wald statistics, levels of significance (p-values), and odds ratios as shown in Table 4.

Results and Discussion

Effectiveness of Institutions for Land Management

The proportions of the respondents who disagreed, those who were neutral and those who agreed with the 18 statements of the Likert scale are presented in Table 1. The results show that, of the 9 statements with positive connotation, the respondents had the highest favourable opinions towards by-laws. In this regard, by-laws were seen to be effective in prohibiting degradation of farmland water sources (98.9%), in prohibiting farmland fires (98.3%) and in promoting soil and water conservation behaviour (97.2%). The other levels of favourable opinions with respect to the statements that had positive connotations are as shown in Table 1.

Identifying by-laws operational in the study area, prohibition of farmland and wild-land fires was the most (36%) mentioned by the respondents. The other by-laws include prohibition of tree felling in the forest reserve (23.7%) and prohibition of degradation of water sources (20%). Additionally, the FGD participants mentioned farming within 60 metres from a water source as banned by the law.

Less favourable opinions were more pronounced for informal norms and beliefs. The most (39.7%) unfavourable opinions were with the notation that some norms promote degradation of farmland water sources, followed by the notation that there are norms that promote farmland fires (29.1%). The least (6.1%) unfavourable opinions were accorded to the statement indicating that there are by-laws which account for increasing cases of farmland fires. The opinions for other statements are as shown in Table 1.

Based on the FGD findings, the norms and beliefs referred to here include *umachinja* (a Luguru term for sucking blood from humans), *katsopata* (a term in Luguru which refers to a tendency to envy a person possessing something or making some good progress) and belief in supernatural powers. The supernatural powers with relevance to land management in the Uluguru Mountains include the magical transfer of yields known in Luguru vernacular as *bukula*. It is a belief that a farmer may plant crops which may grow very well but yet obtains very poor yields, while a neighbouring farmer who invests very little on the same crop harvests a lot at the expense of the one who invests heavily.

Crop yield improvement being a key motive for investment in land management, fear of loss of crops through bukula becomes a factor constraining investment in land management. This explains why the respondents accorded the most unfavourable opinions to the informal norms and beliefs.

The proportions of respondents with unfavourable (18-53), neutral (54) and favourable (55-90) opinions towards institutional effectiveness were 33.3%, 15% and 51.1% respectively. Therefore, overall, the respondents had favourable opinions towards effectiveness of institutions in governing land management. The overall score on the Likert scale was 56.3, which is more than 54 that denoted neutral attitude.

From the discussion above, it is clear that institutions were effective in governing land management in the Uluguru Mountains. Superiority of the formal institutions when compared with informal institutions was attributable to being legally binding. The study provides evidence of presence of informal institutions which discourage land management behaviour. For example, the traditional land tenure system has been associated with weakening land ownership security which in turn demotivates land users from investing in land management. A study conducted in the

Table 1: Proportions of the respondents with respect to opinions towards statements on institutional effectiveness (n=180)

Statement		Disagree (%)	Undecided (%)	Agree (%)
1.	By-laws are instrumental in moving people towards adoption of soil and water conservation (SWC) measures	1.1	1.7	97.2
2.	Traditional land tenure system enhances adoption of SWC measures	27.4	3.4	69.3
3.	It is normatively incorrect to operate a plot on a steep slope without application of appropriate SWC measures	5.0	1.1	93.9
4.	By-laws are instrumental in prohibiting people from degrading farmland water sources	0.6	0.6	98.9
5.	Traditional land tenure system promotes conservation of farmland water sources	21.2	7.8	70.9
6.	It is normatively incorrect to degrade farmland water sources	7.8	3.4	88.8
7.	By-laws are instrumental in prohibiting setting fires on farm plot	0.6	1.1	98.3
8.	Traditional land tenure prohibits actions causing farmland fires	24.6	6.7	68.7
9.	It is normatively incorrect to set farmland fires	6.7	0.6	92.7
10.	There are by-laws which induce reluctance to implementation of SWC measures	83.2	7.3	9.5
11.	Traditional land tenure system has negative consequences on adoption of SWC measures	72.1	6.1	21.8
12.	Some norms in our area promote rejection of SWC measures	70.9	5.6	23.5
13.	There are by-laws which induce reluctance to conservation of farmland water sources	85.5	4.5	10.1
14.	Traditional land tenure system encourages actions leading to degradation of farmland water sources	80.4	6.1	13.4
15.	Some norms in our area promote degradation of farmland water sources	58.1	2.2	39.7
16.	There are by-laws which account for increasing cases of farmland fires occurrence	89.4	4.5	6.1
17.	Traditional land tenure system encourages setting fire on farm plots	74.9	8.9	16.2
18.	There are norms in our area promoting farmland fires	67.0	3.9	29.1

Uluguru Mountains by Mpanda *et al.* (2021) showed that, despite stable tenure for use after allocation, individuals cannot claim perpetual ownership of the piece of cropping land. Changes and redistribution can happen any time; hence, individuals are hesitant to make long-term investment in their farms, such as tree planting or other costly investments like terraces. Also, there is a declining trend in terms of credibility accorded by the Luguru people to their informal

institutions. The growing interaction of the Uluguru Mountains community with the outside world, coupled with the lack of deliberate efforts to promote informal institutions, is a strong force towards the declining adherence to informal institutions. According to Malisa and Mahonge (2023), as a result of the liberalised market economy policies, people in many areas in the Uluguru Mountains have succumbed to external pressures resulting in abandonment of some of their traditions.

From the key informant interviews, a traditional leader from Luale village said:
"Our traditions are fading away; people do not respect them. For example, during our times a 'mentally fit person' wouldn't degrade a water source. But now look at my neighbour here; he has planted eucalyptus trees around a water source located on his farm. In the past, rarely did such a thing happen, and if it did the responsible person would be required to explain himself to the elders. Today you hear them saying leave me alone, those traditions are out-dated".

Contextually, usage of the term *mentally* fit in the above quotation implies that a person not adhering to expected behaviour was equated with a mentally unfit one.

The formal institutions are legally binding. For informal institutions, their socially determined sanction mechanisms have been losing ground with time. This explains further as to why formal institutions have been accorded with more favourable opinions when compared with informal institutions. However, it is worth noting that the ultimate behaviour and hence land management actions is a result of the combined effect of the various institutions at play.

Conditions for Institutional Effectiveness

In order to determine the association that exists between institutional effectiveness and a set of variables assumed to affect the effectiveness of institutions, inferential statistical analysis was performed. In this regard, a multinomial logistic regression (MLR) model was developed and used to test the influence of nine independent variables on institutional effectiveness. The MLR model analysis findings are presented and discussed below.

One of the outputs of the MLR model was the model fitting information. Based on the results, the probability of the model chi-square (55.811) was 0.000, less than the level of significance of 0.05. This means that, the model statistically significantly predicts the dependent variable better than the intercept-only model alone. Also, it means that there is adequate fit of the data to the model and that at least one of the predictors is significantly related to the response variable (Garson, 2008).

Another output was the Pseudo R-square. From the results (Table 2), Nagelkerke R^2 was 0.378 implying that the independent variables entered in the model explained 37.8% of the variance in the dependent variable. According to Garson (2008), Nagelkerke R^2 value, which is the modified form of Cox and Snell R^2, is always higher than Cox and Snell R^2 and is the most reported of the pseudo R^2 estimates.

Table 2: Pseudo R-Square

Pseudo R-square	
Cox and Snell	0.326
Nagelkerke	0.378
McFadden	0.199

Other outputs of importance were the likelihood ratio test and the Wald statistics. The likelihood ratio test evaluates the overall relationship between an independent variable and the dependent variable. The Wald statistics evaluates whether or not the independent variable is statistically significant in differentiating between the two groups in each of the embedded binary logistic comparisons (Bayaga, 2010). According to Garson (2008), the Wald statistic is commonly used to test the significance of individual logistic regression coefficients for each independent variable.

The results showed that there was a statistically significant relationship between three independent variables namely land ownership security (p=0.004), awareness of institutions (p=0.001) and market access (p=0.001) and the dependent variable (institutional effectiveness) (Table 3). The other variables namely age, sex, income and education level of the respondent; farm size and slope did not have statistically

significant relationship with the dependent variable.

Table 3: Factors influencing institutional effectiveness

Effect	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Intercept	299.967	0.000	0	
Age	300.629	0.662	2	0.718
Income	300.834	0.867	2	0.648
Market access	312.998	13.031***	2	0.001
Farm size	301.335	1.368	2	0.505
Sex	300.892	0.924	2	0.630
Education level	307.026	7.059	6	0.315
Slope	302.416	2.448	4	0.654
Land ownership security	311.250	11.283***	2	0.004
Awareness of institutions	313.746	13.779***	2	0.001

***denote significance at 1% level

According to Bayaga (2010), if an independent variable has an overall relationship to the dependent variable, it does not necessarily suggest statistical significance. In fact, it might or might not be statistically significant in differentiating between pairs of groups defined by the dependent variable. Therefore, parameter estimates output has been included and is described and discussed as follows, based on the findings in Table 4.

As indicated in Table 4, market access was statistically significant in distinguishing category 1 of the dependent variable (unfavourable opinion), from category 3 of the dependent variable (favourable opinion). Based on the Exp(B) value (the odds ratio) for market access, the implication is that the survey respondents who spent longer time to reach a market place were 1.0% (1.007-1.0) more likely to be in the group of survey respondents who thought that the institutions were not effective (dependent variable category 1), rather than being in the group of survey respondents who thought that institutions were effective (dependent variable category 3, the reference). This means that, each additional minute to the total time from farm to the market increases (because B is positive) the odds that a respondent subscribes to the opinion that institutions are not effective by a factor of about 0.007.

The results imply that proximity to a market place, which has to do with the possibility of a farmer selling and earning returns from their agricultural produce, is an important condition for institutional effectiveness. It is more plausible for a farmer who has access to a market place to comply with a by-law or prescription related to land management and hence improved agricultural production than a farmer with limited access to a market place. In this case, returns on investment in land management serves as an incentive for compliance. Kessler (2006) asserts that for farmers to be interested in soil and water conservation, it is important to enhance the profitability of agriculture.

Land ownership security and awareness of institutions were statistically significant in distinguishing category 2 of the dependent variable (neutral opinion) from category 3 of the dependent variable. The Exp(B) values for land ownership security indicate that the survey respondents who had strong land ownership security were 78.8% (0.212-1.0) less likely to be in the group of survey respondents who had neutral opinion regarding institutional effectiveness, rather than being in the group of survey respondents who thought that institutions were effective (favourable opinion).

Secure land ownership guarantees a farmer of both short and long-term benefits accruing

Table 4: Predictors of institutional effectiveness

Opinions on institutional effectiveness [a]		B	Std. Error	Wald	df	Sig.	Exp(B)	95% C.I. for Exp(B)	
								Lower Bound	Upper Bound
Unfavourable opinion	Intercept	-1.562	1.273	1.506	1	0.220			
	Age	-0.008	0.013	0.351	1	0.554	0.992	0.967	1.018
	TotIncome	0.000	0.000	0.523	1	0.470	1.000	1.000	1.000
	MrktAccess	0.007	0.002	11.741	1	0.001	1.007	1.003	1.011
	FSize	-0.089	0.080	1.226	1	0.268	0.915	0.782	1.071
	[Sex=1.00]	0.352	0.378	0.867	1	0.352	1.422	0.678	2.982
	[Sex=2.00]	0[b]			0				
	[EdLevel=1.00]	2.117	1.093	3.753	1	0.053	8.303	0.975	70.671
	[EdLevel=2.00]	0.867	1.222	0.504	1	0.478	2.381	0.217	26.095
	[EdLevel=3.00]	0.367	0.862	0.181	1	0.670	1.443	0.267	7.811
	[EdLevel=4.00]	0[b]			0				
	[Slope=1.00]	0.137	0.721	0.036	1	0.849	1.147	0.279	4.708
	[Slope=2.00]	0.562	0.450	1.562	1	0.211	1.754	0.727	4.234
	[Slope=3.00]	0[b]			0				
	[LandOwnSec=1.00]	0.300	0.469	0.410	1	0.522	1.350	0.539	3.383
	[LandOwnSec=2.00]	0[b]			0				
	[Awareness=1.00]	-0.775	0.394	3.866	1	0.049	0.461	0.213	0.998
	[Awareness=2.00]	0[b]			0				
Neutral opinion	Intercept	-0.996	1.750	0.324	1	0.569			
	Age	0.005	0.017	0.085	1	0.770	1.005	0.972	1.040
	TotIncome	0.000	0.000	0.093	1	0.760	1.000	1.000	1.000
	MrktAccess	0.002	0.003	0.684	1	0.408	1.002	0.997	1.007
	FSize	-0.012	0.106	0.013	1	0.908	0.988	0.803	1.215
	[Sex=1.00]	0.056	0.521	0.012	1	0.914	1.058	0.381	2.935
	[Sex=2.00]	0[b]			0				
	[EdLevel=1.00]	1.965	1.614	1.482	1	0.224	7.134	0.302	168.798
	[EdLevel=2.00]	-17.217	0.000		1		3.33E-08	3.33E-08	3.33E-08
	[EdLevel=3.00]	0.536	1.240	0.187	1	0.666	1.709	0.150	19.438
	[EdLevel=4.00]	0[b]			0				
	[Slope=1.00]	0.634	1.011	0.394	1	0.530	1.886	0.260	13.667
	[Slope=2.00]	0.787	0.740	1.134	1	0.287	2.198	0.516	9.366
	[Slope=3.00]	0[b]			0				
	[LandOwnSec=1.00]	-1.553	0.572	7.367	1	0.007	0.212	0.069	0.649
	[LandOwnSec=2.00]	0[b]			0				
	[Awareness=1.00]	-1.823	0.530	11.834	1	0.001	0.162	0.057	0.457
	[Awareness=2.00]	0[b]			0				

a. The reference category is: 3 Favourable opinion.
b. This parameter is set to zero because it is redundant.

from their investment in land management. Chonde (2015) reported that land ownership security influenced men in Malawi to invest in land. Therefore, institutions such as by-laws and prescriptions related to land management, are more likely to influence the behaviour and hence actions of land users with strong, than those with weak, land ownership security. Similar findings were reported by Yami *et al.* (2012) that the growing number of landless youths in rural villages constrained the effectiveness of village by-laws.

Similarly, for awareness of institutions, the odds ratio was such that the survey respondents who were aware of existence of institutions for land management were 83.8% (0.162-1.0) less likely to be in the group of respondents who had neutral opinion, rather than the group of survey respondents who thought institutions were effective. Awareness of institutions was also statistically significant in distinguishing category 1 of the dependent variable from category 3 of the dependent variable. The Exp(B) was such that the survey respondents who were aware of existence of institutions for land management were 53.9% (0.461-1.0) less likely to be in the group of respondents who had unfavourable opinions, rather than being in the group of survey respondents who thought institutions were effective. Awareness of the rules (formal or informal) and procedures is an important aspect of the process of creating rule/procedure adherence practice. For example, knowledge transfer from elders to young generation has proven to be effective in passing on conventional land management practices like ridging (establishment of earth embankments across the slope, done when digging the land) in the Uluguru Mountains.

Farming being the predominant activity in the area, and ridging a conventional practice, children and youths have high exposure to the practice as they learn from the elders and see it in the fields. One way to increase awareness about a particular institution is through involvement of the people in its formulation and enforcement. Yami *et al.* (2012) observed that the active involvement of all users in decision making enhanced the effectiveness of the village by-laws.

Descriptive analysis was performed with the aim to provide additional information regarding the motivations for adherence to prescriptions on land management. In this regard, 82.3% of the responses were such that adherence to prescriptions on land management was motivated by concern about the effects of fire, soil erosion and degradation of water sources on the land and the environment at large. In this case, the FGD participants identified UMADEP, CARE International, Uluguru Nature Reserve and Tanzania Forest Services as the main sources of awareness. On the same theme, 7.2% of the responses suggested that compliance was driven by worry of being punished by the law. This means that, the respondents were ecologically responsible and not just individually rational.

The above findings and discussion imply that imposition of sanctions against non-compliance and ascertaining individual benefits from land are important but not sufficient conditions for adherence to prescriptions on land management. This corroborates the observation by Vatn and Vedeld (2012) that people act according to plural motivations. That is, actions on land management are not guided by individual rationality (the logic of costs and benefits) alone; they are also guided by the logic of appropriateness or social rationality. Elaborating on the logic of appropriateness, Babili *et al.* (2015) contend that human agencies follow rules, not because it is rationally the best strategy but because institutions define appropriate behaviour in a given community, irrespective of implied costs and benefits.

Conclusions

Combined, the formal and informal grassroots land management institutions in the Uluguru Mountains are effective in that their ultimate effect is more of fostering actors' land management behaviour. That is, they favourably regulate motivations, preferences and actions related to soil erosion and farmland fires control and farmland water sources conservation. While the formal institutions are considered to be legally binding, the socially determined sanction mechanisms of the informal institutions have been losing ground with time. However, the ultimate behaviour and

hence land management action is a result of the combined effect of both formal and informal institutions. Thus, presence of institutions which discourage land management behaviour works counterproductively with the institutions which motivate land management behaviour. This explains the presence of anthropogenic threats to the land resource in the Uluguru Mountains despite presence of effective land management institutions. Land ownership security, awareness of institutions and market access are significantly important conditions for institutional effectiveness. They provide knowledge on, and incentives for, adherence to rules, norms and conventions relevant for land management.

The study posits that imposition of sanctions against non-compliance and ascertaining individual benefits from investment in land management are important but not sufficient conditions for adherence to rules, norms and conventions on land management. For example, in the Uluguru Mountains, rule-adherence motivated by ecological concerns was evident. That is, deterrence from farmland fires, soil erosion and degradation of water sources motivated by awareness of their effect on the land and the environment at large. Thus, people act according to plural motivations. That is, actions on land management are not guided by individual rationality (the logic of costs and benefits) alone; they are also guided by the social rationality, that is, doing what is appropriate or expected by a given community. The study confirms that institutions do influence the individual—the values and preferences an individual holds and what is considered right to do in certain situations.

The policy implication from the study is that enhancement of land ownership security and access to agricultural crop markets ought to be the policy priorities as these are necessary conditions for successful land management interventions. Involvement of local leaders and the ordinary community members in formulation of land management by-laws would enhance awareness and hence the likelihood of adherence to the by-laws.

In the efforts to ensure grassroots institutional effectiveness, it should be underscored that, while it is important to invest in formulation and/or amendment of formal rules for land management as deemed necessary, it is equally important to promote the good aspects of informal institutions, i.e. practices, norms and beliefs, which enhance land management behaviour. This is important because much as one institution could be enhancing land management behaviour, this effect could be counterbalanced by presence of another institution that discourages land management behaviour. Moreover, when formulating and/or amending grassroots institutions for land management, it is crucial to consider the characteristics of the actors and the attributes of the land resource. This is based on the observation that these have an effect on institutional effectiveness.

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