

Table S1. List of institutional actors, their characteristics, 4Rs and notes on differences between the intervention and non-intervention villages.

Institution	Characterization	Rights	Responsibilities	Resources (ngitili benefits and other resources)	Notes
Village council (VC)	Popularly elected council of 15-25 members with village chairperson as the chair and often VEO as the secretary. They plan and coordinate activities and formulate bylaws, which are rendered to village assembly approval.	Objective setting, monitoring, benefiting	Ngitili owner's responsibilities† and involves village assembly in decision-making	Several sources of financial resources incl. REDD money, annual budget some thousands USD, lack of money, transport, education, stationaries etc.	In non-intervention village subvillage administration instead more important, has rights to benefits and has owner's responsibilities
Village chairperson	Popularly elected chair of the village.	Monitoring	Ngitili owner's responsibilities† as a village council member	Small allowance, annual budget some hundreds USD (from own pocket), lack of money, transport, education, stationaries etc.	
Village executive officer (VEO)	Appointed by District execute officer. Supervise and report on village development activities to district.	Monitoring	Ngitili owner's responsibilities† as a village council member	Small allowance, annual budget some tens USD (from own pocket), lack of money, transport, education, stationaries etc.	
Subvillage administration (chairperson)	Elected representative of subvillage. Supervise and manage subvillage activities. Depending on village include a secretary and 2-3 advisors	Objective setting, monitoring, benefiting	Ngitili owner's responsibilities† (in intervention villages does not give permits or punishments or make rules)	Supervision fee of property sales, annual budget none or some hundreds USD (from own pocket), lack of money, transport, stationaries, education, staff etc.	In intervention villages doesn't have rights to benefits, in village A allowance sometimes and money from permits
REDD project	REDD pilot project 2010-2013 coordinated by NGO TaTEDO in partnership with government public service centre NAFRAC	Facilitation	Resolve conflicts, advise on rule making, revenue distribution and ngitili allocation	Donor funding, ~ 2 million USD for 4 year project, lack of funds for follow up	In intervention villages only, project active 2010-2013 and currently occational monitory visits
Land and Natural Resources Department	District department with forest officer and assistant officers. Enforce laws and policies and link NGOs, CBOs and private sector with public sector in NRM	Facilitation, monitoring, initiate revoking of village management agreement (revoked by district council)	Enforce and inform on rules, give punishments and resolve conflicts if village and ward level fails, advise on rule making, revenue distribution, ngitili allocation	Taxes and fines via district council, annual budget some tens of thousands USD, lack of money, transport, education, staff etc.	Msalala district council has less financial sources and smaller budget than Kahama town council which decrease resources allocated to department and ward and village level.
Sungusungu	Community law and order policing organization, vigilante movement. Set administration, commanders at subvillage, village and ward level. All village inhabitants constitute the sungusungu army.	Benefiting	Enforce and inform on rules, give punishments and resolve conflicts, involved in rule making	Different fines and REDD money, annual budget some tens or hundreds USD, lack of money, transport, weapons, equipment etc.	In village A not involved in giving punishments or conflict resolution, In non-intervention village no revenue from ngitili

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Primary school (school committee)	Primary schools have established ngitilis which are managed by the school committees in collaboration with village council.	Objective setting, use and benefiting from school ngitili	Ngitili owner's responsibilities†, in village A doesn't give permits which are given by village council, resolve conflicts and land conflicts on own lands	Several sources of financial resources incl. REDD money, annual budget some hundreds or thousands USD, lack of money, transport, equipment etc.	In village A after REDD project they need permit from village council for usage
Village REDD group	Organization of ngitili owners who were registered during REDD pilot project and are eligible for carbon credits. Registered village, subvillage and school ngitilis also represented in the organization.	Objective setting, monitoring and benefiting	Make rules, enforce and inform on rules, resolve conflicts	REDD money and group IGAs, annual budget some hundreds USD, lack of money, transport, equipment, education etc.	Exists in intervention villages only
Village land council	Committee dealing with land registration and conflict resolution. Each subvillage has a representative.	None	Enforce and inform on rules and resolve land conflicts	Fee for opening a case, annual budget none, lack money, transport, stationaries, education etc.	Doesn't exist in village B
Village environmental committee	Committee dealing with environmental safety and conservation.	Monitoring	Make rules, enforce and inform on rules and resolve conflicts	Sometimes support from village council or individuals, annual budget none or some tens USD (from own pocket), lack of money, transport, stationaries, education etc.	Doesn't exist in non-intervention village
Elders' council, village and subvillage	Depending on village has one or several councils in subvillage and representatives from these form the village level council. Only men. Preserve traditions and resolve conflicts.	Monitoring	Enforce and inform on rules, resolve conflicts and land conflicts, advise on rule making and ngitili allocation	Different fines and group IGAs, annual budget some tens USD, lack of money, transport, stationaries, education etc.	In non-intervention village works closely with subvillage chairperson
Village inhabitants (village assembly)	Persons over the age of 18 constitute the village assembly.	Objective setting, use and benefiting	Approve rules, permits and revenue distribution, enforce rules (patrol)	NA	Village inhabitants constitute the sungu sungu army
Ward agricultural officer	Extension worker in agriculture, livestock and forestry matters. Works in all villages.	Monitoring	Enforce and inform on rules, resolve conflicts (evaluate extent of violation), advise on rules and ngitili allocation	Salary from central government, annual budget none or some hundreds (from own pocket), lack of money, transport, stationaries, equipment, education etc.	Doesn't work in non-intervention village

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Mgambo	People's militia, each ward has one or more officers.	None	Enforce and inform on rules (patrol, arrest violators)	Fine money from violators, annual budget some tens USD (from own pocket), lack of money, transport, weapons, staff etc.	In village B and village C not working on ngitili issues
Ward executive officer (WEO)	Appointed by District executive officer. Supervise and report on ward development activities to district.	Monitoring	Make rules (approve, send to district), enforce and inform on rules, if village fails resolve conflicts and land conflicts, advise on revenue distribution and ngitili allocation	Salary from central government and irregular grants from district, annual budget some tens or hundreds (from own pocket), lack of money, transport, stationaries, staff etc.	In village B no district grants
Councilor	Elected by popular vote in ward. Represent ward in district council.	Monitoring	Make rules (approve, send to district), enforce and inform on rules, if village fail resolve conflicts and land conflicts	Monthly allowance and sitting allowance, annual budget some thousands USD (in village B from own pocket), lack of money, transport, education etc.	In village B no allowance but money for transport
NGOs and CBOs	Village or district level organizations and associations.	Facilitation	Advice on and support ngitili management, inform on rules	Different donors, member fees, CBOs also from IGAs, annual budget range from some thousands upto million USD, lack of money, transport, education, funders etc.	Operates only in intervention villages
Ward land tribunal	Ward tribunal dealing with land conflict resolution. Each village has a representative.	None	Enforce and inform on rules, if village fails give punishments, resolve conflicts and land conflicts	Fees for opening a case, annual budget none or some tens USD, lack of money, transport, stationaries, staff, education etc.	
Primary court		None	Enforce rules, give punishments, resolve conflicts	Salaries, permits and fines, annual budget NA, lack of money, transport, stationaries, staff etc.	In village B and village C has not been involved in ngitili management
Tanzania Forest Service (TFS), Kahama district	2013 established government agency for revenue collection and national forest resource management.	Facilitation, benefiting	Advise on rule making and enforcement, revenue distribution, if lower levels fail resolve conflicts, inform on rules	Several sources of financial resources, annual budget some tens of thousands USD, lack of money, transport, equipment, staff, education etc.	The village and ward level do not recognize TFS as ngitili institution

† make rules, give permits, decide revenue distribution, enforce rules, give punishments, allocate ngitilis, resolve conflicts, resolve land conflicts and inform on rules.