

# Institutional changes in management of Common Pool Resources (CPR) in Eastern Same Tanzania: Challenges and opportunities

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## Abstract

During the last four decades Tanzania has witnessed several macro and sectoral policy changes with a trickle down effect, shaping both the management of CPR and livelihoods of resource users and other stakeholders. The study was carried out in the eastern part of Same district, focusing on the highland-lowland CPR interaction among the *Maasai* pastoralists and the *Pare* who are predominantly farmers. The main objective was to analyse institutional changes underlying the management of CPR and the factors driving the change with emphasis to resources such as forest, water for irrigation and grazing lands. The theoretical approach for the study is based on Hardin characterization of the tragedy of the commons which is the basic problem of CPR management and the way contemporary scholars such as Ostrom and other researchers have tried to approach the problem. Primary data collection involved the use of anthropological methods and socio-economic surveys employing household questionnaires, key informant interviews, oral histories and participants observation. Secondary sources such as government reports were also used. The results indicate that institutional changes have resulted into resource use conflicts and the challenge is that these conflicts have been increasing. The types of conflicts included micro-macro conflicts between conservation authorities and resource users, inter-micro micro conflicts between farmers and between farmers and herders and intra-micro micro conflicts between people in the same family or household. The factors that increased the likelihood of institutional changes included political, technological and distance to markets. The study recommends ecosystem based institutional framework that is capable of accommodating the changes, improving people's welfare and sustainable management of the CPR in the study area. The opportunity that is presented by the current policy changes where power is devolved to local resource users and stakeholders can be utilized to achieve the desired goals of sustainable management of the CPR.

*Key words: Institutional changes, common pool resources, management, governance, Same, Tanzania*

## Introduction

In the last four decades, Tanzania has been going through changes in the institutional settings of different communities that affected the management of renewable resources particularly the common pool resources (CPR). The changes include political, socio-economic, and cultural. Such changes necessitated the dismantling of previous CPR property regimes that were considered as outdated by the new administrative authorities; the regimes were therefore replaced by the new ones. Unfortunately, because of poor

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institutional setup and failure to take into consideration the logic of the traditional Pare socio-ecological management system, the new setup were not effective and equitable. As a result *Pare* and *Maasai* rules of access and control of the resources were altered. This further resulted into poor management of the resources and conflicts, which is a sign of the tragedy of the commons.

The Pare and Maasai are the two ethnic groups that were found to influence the utilization and management of the CPR. The Pare are predominantly farmers and are found in both the mountain and lowland while the Maasai are predominantly pastoralists and are found mainly in the lowlands. Other ethnic groups include shambaa, hehe, kinga, and chaga. This paper aims at analysing the institutional changes underlying the management of CPR by tracing the trajectory the institutional changes have taken over time, and look into the opportunity available in mitigating the negative impacts resulting from the changes.

Building from the foundation of the tragedy of the commons by Hardin(1968), it is interesting to include in this study the important contribution of the contemporary scholars (Ostrom, 1999, North, 1990, Wade, 1987, Kayambazinthu *et al*, 2003, Campbell 2001, and Agrawal, 2001) in the discussion of the implications of institutional changes in the management of CPR. In this study, the CPR referred to are forests, grazing lands/pasture, and irrigation water that is a crosscutting mobile resource which is of critical importance to communities especially in the lowlands and semi-arid areas.

### **The setting of the study area and methods for data collection**

The study was conducted in four villages in the eastern part of Same District which is part of the Pangani River Basin located between 4° S and 4°45' S and between 37°30'E and 38°15' E. The villages namely Mvaa and Mpinji are found in the mountain side and Maore and Ndungu which are found on the lowland floodplain. The selection of the study area was based on the criteria used by NCCR North-South<sup>2</sup>, (Hurni and Wiesmann 2004), where it was premised that highland-lowland and semiarid situation/systems make up a syndrome context in which resource rich highlands are surrounded by resource poor lowlands. This unequal constellation results in a broad range of interactions and conflicts between different stakeholders and their interests regarding resource use. Figure 1 indicates the socio-ecological system in the case study area.

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<sup>2</sup> Swiss National Center for Competence in Research: An international research partnership for mitigating syndromes of global change for countries in the north and south.

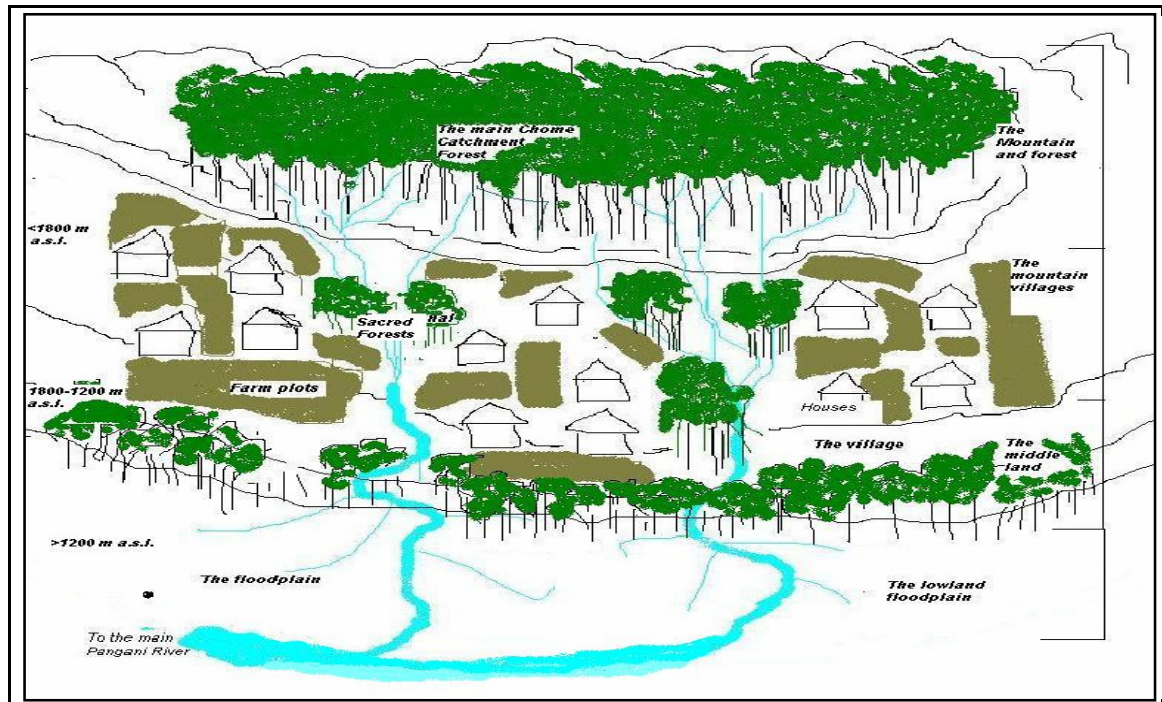


Figure 1: A sketch of the Socio-ecological system of the study area

Such highland-lowland systems suffer from problems ranging from resource degradation, poor management of the fragile ecosystems, poverty, governance failure, and resource use conflicts. These problems are interlinked, forming a cluster of problems which are the characteristics of highland- lowland systems. Data collection involved the use of Participatory Rural Appraisal (PRA) and household questionnaire to collect both qualitative and quantitative data. Other method used included focus group discussion and oral histories or biographies..

### **Institutional changes**

Institutional change in the management of CPR in the study area was analysed with respect to people-resource relationship and the embedded governance structures with the understanding that institutions are dynamic social interventions, shaped by local experiences and influenced by external factors (Bailey and Zerner, 1992). The critical elements in the governance structures analysed include informal rules, norms, customs, practices, formal laws as well as organizational structures. We therefore, highlight the processes of institutional change overtime and the main factors that have driven these changes. In this study, the major institutional changes can be discussed under two time periods; the pre –independence and the post-independence era. While, more emphasis is on the post independence era while the pre-independence era is discussed as a benchmark for analysing institutional changes and the environment in which the changes occurred.

### **Institutional development/change during the pre-independence era 1914--1961**

The management of CPR namely forests, water, and pasture in the pre-independence era were regulated by Pare institutions in the mountains by both Pare and Maasai institutions in the lowlands. The three resources were the most important elements in the fabric of both Pare and Maasai cultures and institutional frameworks. During the colonial era, the colonial government introduced indirect rule system, initiated by the Germans, and adopted by the British thereafter (Spears, 1997; Nyerere, 1966; Giblin 1992). In this case, the colonial governments integrated traditional leadership and institutions into colonial administration through Chiefs (*Wafumwa*), making it easier to rule their subjects with little confrontation. However, this was not the case with the *Maasai* who were constantly in conflicts with the governments. Thus through the indirect rule, the colonial government succeeded in exploiting the local people through their leaders (Spears, 1997; Sheridan, 2000). This arrangement however, allowed the community to continue with some traditional practices, such as ancestral veneration in *Mph'ungi*, and initiation ceremonies in *Mshitu wa ngasu among the Pare*.

The British colonial government who came after the Germans, continued with the German conservation policies. Several Ordinances were enacted to centralise the management and control of resource utilization by the state. The Ordinances include the 1921 Forest Ordinance, which prohibited access and utilization of the reserves by local communities, the 1923 Land Tenure Ordinance, which declared the whole land of Tanzania (then Tanganyika) to be public land, whether occupied or un-occupied. The Game Preservation Ordinance of 1921, and the Game Ordinance of 1940 (which was later repealed and replaced by the Fauna Conservation Ordinance of 1951) were used to regulate hunting and utilization of wildlife resources, thereby curtailing the utilization of wild animals by hunters and this affected the communities' food security. The Water works Ordinance of 1958 also centralized utilization and management of water resources by the state. All these changes contributed to ideological changes that made local resource users to lose a sense of ownership of the resources. The local communities were then supposed to provide evidence of resource ownership or justification of utilizing a particular resource being claimed. In general, the implementation of these policies resulted into the eviction of native inhabitants from their traditional residential areas and prohibiting access and traditional communal utilisation of the resources.

The role of religion in changing and shaping the life of the Pare society, especially in the mountains cannot be ignored. Important institutional development in the pre-independence era was the introduction of Christianity. In the south Pare Mountains, Lutheran and Seventh-day Adventist denominations dominated while in the lowland. The Islamic religion was introduced during the slave trade and the Anglican Church came later during the British rule. Christianity in the mountain villages was introduced sometimes in 1903/4 by German missionaries and continued to spread after independence. Converts were not allowed to participate in rituals such as initiation ceremonies performed in the forest. Some clan heads who became Christians surrendered their traditional forests to the village governments or churches. One traditional forest at Mvaa village formally owned by "*Wangulwi*" clan is now owned by the Lutheran church.

Though the missionaries came to the Pare with a primary objective of evangelising the people, they also shaped the moral economy of the *Pare* society through formal education whereby several schools especially in the mountain villages were opened. At school, agriculture was part of the curriculum whereby important cash crops such as coffee and cardamom were introduced through trial plots. These were established by the missionaries with the help of the colonial government. Early Christians in the area were encouraged to start small coffee farm plots and eventually coffee became their primary cash crop. Thus, early Christians became economically better through the sale of coffee. They were also capable of sending their children to school. These people became better off in the society as their children were easily employed in towns and could bring back remittances to sustain their parents. The same trend was observed in Arusha and Meru in northern Tanzania (Spears, 1997). In this way, some people started drifting from the moral economy of the *Pare* and were instead absorbed in the Christian moral values and life style.

### **Rules of access and Control of CPR in the pre-independence era**

In the mountains, access to CPRs and control were similarly affected. Before the missionaries came, the *Pare* were not used to lumbering or pit-sawing in the forest, it was the missionaries who started lumbering in Chome Forest Reserve so as to produce timber for building churches, houses, and furniture. People started looking at the forest from a commercial point of view, instead of using it for subsistence only. This compares well with Agrawal (2001) who pointed out that the arrival of new technology and markets may create different incentives about the products to be harvested as different community sub-groups depending on CPR gain variable levels of access. In Mpinji village, where Christianity took roots early, forest resources have been severely depleted, and the forest boundary is relatively far from the village boundary.

In 1951, Chome Forest Reserve was gazetted through government note No. 125/25/5/1951, and variation order No 303/20/6/1958. Using the Forest Ordinance Cap 389 of 1921, a series of prohibitions and taxes for utilizing the reserve were imposed. During FGD, it was pointed out that before Chome Forest was declared a forest reserve, the forest was also used as a grazing land. Cattle, sheep and goats were kept in the forest for more than a week without being taken home. Since the forest was sacred, it was considered to be the safest place to keep livestock. Moreover, there was plenty of pasture and water. Taking into consideration that the mountains were generally highly populated, it is also possible that it was convenient to keep livestock in the forest to reduce farmer-herders conflicts. However, after the forest reserve was gazetted, community members who wanted to utilize the forest as their grazing area were forced to pay grazing fees. In 1958-59, the fee was 3 cents per cattle and 1 cent per small ruminant per month (Mrutu, 2004 Personal communication).

In the same year, the Mkomazi Game Reserve in the lowlands was gazetted. Through the Fauna Conservation Ordinance Cap 102 of 1951, all pastoralists had to have grazing permits after paying fees to graze in the reserve. Apart from pastoralism, the Mkomazi

game reserve was also important for Pare hunters and honey gatherers. The chief (*Mfumwa*) among the Pare was the overseer of all administrative issues, including punishing the defectors. On the other hand the *Maasai* were generally marginalized politically because of their political and institutional setup that could not match with the colonial setup. In general, since the arrival of colonial powers the pattern of CPR management and access had been one of increasing state intervention and steady erosion of local institutions, customary rights, and the eventual change in perception, ideology and moral economy of local communities towards CPR.

The colonial era ended in 1961 when Tanzania mainland, (Tanganyika by then) became an independent state under the leadership of Mwalimu J.K. Nyerere. The independent government determined to replace the colonial capitalist economy with the African socialism (*Ujamaa*). This era was characterized by a volatile mix of ideologically driven policies (mostly modelled after eastern socialist countries) and authoritarian administrative practices inherent from the colonial state (Sheridan, 2000).

### Factors driving institutional change in the post colonial era

Institutional changes are driven by different factors including political and socio- economic forces that favour or oppose them. The balance of power between opposing and supporting factors determine the direction or dynamics of change. A logistic model was used to assess the likelihood of some factors to drive institutional change in the management of CPR. The factors that were found significant in influencing/driving institutional change were political changes, technology change, and distance to markets Table 1 summarises logistic regression results for the study villages.

**Table 1: Main factors driving institutional change in the study area**

	B	S.E.	Wald	df	Sig.	Exp(β)
Political change	2.123	.698	9.242	1	.002*	8.358
Technology change	1.504	.632	5.664	1	.017*	4.500
Distance to Market	-.374	.180	4.292	1	.038*	.688
Transactional cost	.284	.212	1.806	1	.179	1.329
Dependence on CPR	-.377	.241	2.457	1	.117	.686
Immigration	.228	.298	.587	1	.444	1.256
Household size	.361	.303	1.418	1	.234	1.434
Constant	-3.138	.869	13.026	1	.000	.043

Note: \* significant at 0.05 level.

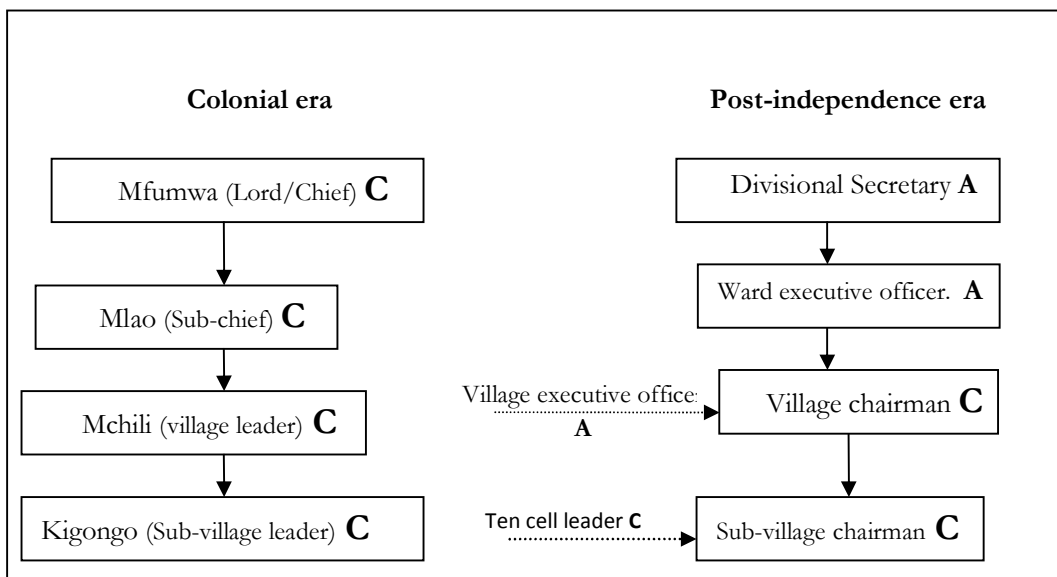
The model predicted 93% of the variations in the model. The model -2LL =75.623 and the LL ratio chi square was 45.517 ( $p<0.05$ ) which shows that the model fits the data significantly.

### Political change

The results show that an increasing magnitude of political change significantly increased the likelihood of institutional change at the local level ( $p<0.05$ ) by a factor of 8.358. This shows that an increase in political happenings increased the likelihood or increased the

odd ratio of institutional change. Since the odd ratio is the measure of the effect size or the ratio of relative importance of the independent variable in terms of the effect on the dependent variable's odds, the results reveal that political change has the greatest effect (contributes 45% of the total effect), and therefore, it will be discussed in more detail. With respect to the study, changes at the national level had influenced changes at the local level. Important political changes that took place since 1961 which are relevant to this study include; Political independence (1961); Village settlement schemes (1962-65); The Arusha declaration (1967); The Villagisation programme (1968-1976); The Structural Adjustment Programme (SAP) (1982-1992); and Sectoral policy changes (1990s).

The traditional institutional structures for CPR utilization and management in the study area were formerly based on traditional rules, norms and culture of different clans of the *Pare* community. After independence, and with the introduction of Socialism and Self Reliance policies, institutional structures for the management of CPR were changed and centralized by the state (URT, 1997). Figure 2 provides comparative political administrative structures at the local level before and after independence. After the changes were effected, the chief's position was abandoned in the study area. The same territories which were under chiefs became divisions, the sub-chiefs (*Walao*) became village executive officers or village chairpersons whose election was based on TANU membership rather than clan affiliation. The *Wafumwa* regimes ended in 1963 (URT, 1997; Hyden, 1980).



**Figure 2: Administrative structures of pre-independence and Post-independence period**

Note: **C**; Inherited/Elected from the community **A**: Appointed by the government

The results also show that the village government leadership was largely imposed by the government. The appointed staff lacked legitimacy of the local communities, this was in

contrast with the pre-independence time when local leaders usually had people's legitimacy and had wide knowledge of norms and rules of the society. On this, Ostrom (1999) argues that an important way of enhancing the likelihood of using reciprocity norms in commons is to increase the proportion of participants who are well known in a community, have a long-term stake in the community and find it costly to have their reputation for trustworthiness harmed.

In the new institutional setting, Divisional Secretaries were employees of the central government and therefore they were inclined more to advance the requirements of the central government. The Ward Executive Officers (WEO) and Village Executive Officers (VEO) are the employees of the District Council while the Village Chairmanship, Sub-village leaders and ten cell leaders are elected by the villagers. Before the advent of multiparty democracy in 1992, it was mandatory that a government leader at village level should be a member of the ruling party, TANU and thereafter, CCM. The village government was then more answerable to the party than to the community. This institutional framework did not provide enough room for communities to have a voice and power in decision making. According to Ostrom (1990), to have an institutional robustness in the management of CPR, appropriators should have the rights of devising their own institutions that are not challenged by external governmental authorities. This shades some light on the way a gradual power shift took place in the post-independence era. However, the most important political turning point and institutional changes emanated from the Arusha declaration whose implementation went abreast with a forceful creation of new settlements under the villagization scheme.

Apart from the structural changes in leadership and some institutions, the implementation of villagization programme of 1968-1975 had a minimal impact on mountain villages. This can be attributed to the fact that high population density and the mountain terrain could not give room for reallocation and the acquisition of enough land for *Ujamaa* farming activities. The villagisation programmes of 1974 (*Sogeza*) caused reallocation from traditional areas in the lowland villages. The local rules and regulations, which were operational in the management of resources, became ineffective as the political system changed local structures that were responsible for managing CPR such as water, forests, and grazing lands. Only the management of traditional forests especially in the mountains remained under the village community. The villagization programme allocated new villages to livestock keeping communities in the lowlands (Mheza and Makokane villages) where basic needs such as school, water for both domestic and livestock were supplied. In 1979, the government decided to divide Pare district into Mwanga (north Pare) and Same (south Pare) districts.

This was followed by a change in political administrative boundaries of the divisions in the mountains and the lowlands, whereby the mountains formed their own administrative units such as villages, wards and divisions. The mountain communities were therefore separated from the lowland communities. The setting became disjointed with the rules and norms regarding utilization of irrigation water and forests. Before 1979, the mountains and the lowland were treated as one complex ecosystem that required a coordinated resource



management system. The rules required that the mountain communities should protect water sources and use water in the daytime for irrigating their crops but leave the water to flow freely downstream at night.

It was also reported that two days per week, (Sunday and Saturdays), the water was allowed to flow down to Mkomazi Game Reserve for wildlife utilization and pastoral communities living in and outside the reserve. This was strictly observed and monitored by local leaders and community members under the chiefdoms. This indicates how traditional Pare society observed equitable resource distribution in the pre-independence era. The rules are no longer respected as the mountain communities have their own political administrative setup and cannot be sanctioned by the downstream administration or game authority. Costanza and Forke (1996) and Ostrom (1990) argue that the best way to manage a complex system such as a drainage basin is to look for a synergy between ecosystem services and different land uses with all the interconnections. Institutions crafted in this way have a better chance of sustaining the resource base and at the same time providing the needs for all possible beneficiaries. In the study area, this remains to be a problem because of the failure to acknowledge the interconnections between ecological services and the different land uses.

In 1987, more less the time when the government stopped timber harvesting in the Chome Forest Reserve, the *Maasai* and other agro-pastoralists were barred from using the Mkomazi Game Reserve as a grazing area, and this forced the *Maasai* to move to other parts of the floodplain while others proceeded to the Rufiji floodplain in search for pasture (Brockington and Homewood, 2001). This migration increased pressure on the floodplain resources due to the increased number of livestock in the areas which were formally used by farming communities only. During the *Ujamaa* era, more emphasis was put on crop production. More land was cleared to pave way for agricultural production. The opening up of land for crop production encroached the boundaries of forests, rivers banks, water streams, woodlands, and grazing areas. Vuasu (Pare) Cooperative Unions (VCU) created a more favourable environment for peasants to produce more by providing credits for farm inputs and a ready market for their crops. The functions of VCU reduced the transaction costs in terms of time and money for the farmers. This increased productivity and reduced inconveniences.

The colonial economic policies started to change soon after independence while the economy of the country centred on agriculture was still booming. However, as highlighted earlier, the economic performance during *Ujamaa* period was poor (Hyden, 1980; Malyamkono and Bagachwa, 1990). It is obvious that the deterioration was caused by among others, the government's economic strategy that had many structural difficulties in almost all sectors of the economy. In early 1980s, Tanzania, aiming at improving its economy, introduced market oriented economic reforms in the name of Structural Adjustment Programme (SAP), which brought in several macro and sectoral policy changes. The reforms were mainly enforced by the International Monetary Fund (IMF) and the World Bank (Malyamkono and Bagachwa, 1990; Eriksson, 1993). Under SAP, all farm input subsidies which the government used to provide, were abolished. Cooperative

unions like VCU (a combination of crop producers of coffee, rice and other crops in the district) which provided an enabling environment to farmers by providing them with farm inputs (fertilizers, pesticides and insecticides) and credits were abandoned, and the market was liberalized. This aspect increased the share of private sector in the market, which consequently decreased the VCU bargaining power. This development gave the private sector more influence especially on setting prices for crops, irrespective of the production costs. Table 7 indicates price changes of different products over the last 15 years.

In the mountain villages, where coffee was an important cash crop for many decades, the fall in coffee prices had a direct negative impact on household economy and also livelihood strategies. Between 1983 and 1990, coffee price dropped from US\$ 3,500 to \$ 1000 per ton or US\$ 1 per kg, and in 1995 the price was US\$ 1.3 per kg. Thereafter, the prices have been fluctuating following the removal of input subsidies and the rise of the production costs without any alternative formal credit facility, the situation discouraged coffee farming in the mountains. Most farmers uprooted their coffee with the exception of a few farmers who still kept their coffee to exploit the local market. This resulted into people exploiting the forest resources as an alternative income generation activity. This has severe negative impact to Chome Forest Reserve as illegal timber harvesting is rampant (UNDP/GEF, 2003; IUCN, 2003). Table 2 explains the change in relative prices that affected livelihoods.

**Table 2: Price changes between 1990 and 2005 (Prices in USD)**

Product	Years			
	1990	1995	2000	2005
<b>Timber price/m<sup>3</sup></b>				
Price on site	27.83	88.37	100.30	85.91
At the market	39.78	121.30	130.61	124.07
Coffee price/kg*	1.00	1.30	3.00	1.70

Source: Own survey data, and KNCU office Moshi 2004/2005

\* First class coffee

During a market survey of forest products it was revealed that timber prices have increased from US\$ 27.83/m<sup>3</sup> in 1990 to US\$ 85.91/m<sup>3</sup> 2005 for Arusha and Moshi markets. This is an indication of the change in relative prices, which is a micro economic indicator, showing how people react to changes in relative prices. The major changes in price are observed during the fall of coffee prices and production which resulted into an increased number of people involved in illegal timber business. The increase in timber prices relative to coffee was and is still a big incentive for local people and timber traders to continue harvesting timber despite the risk of being arrested as the forest was declared closed for timber production in 1987. Figure3 indicates the main sources of household income in the mountain villages surveyed.

The results indicate that between 1985 and 2005 the income sources for most households have shifted from coffee to other crops and illegal logging. In 1985, 60% of household

depended directly or indirectly on coffee and 37% on cultivating other crops, only 3% depended on logging. On the contrary, the results indicate that in 2005, coffee contribution to the household economy was only 3% while farming of other crops was 51.5%, logging contributed 46%. Azhar (1993), explaining a similar situation in Pakistan, argues that in many cases as new market actors gain access to a particular market they may seek alliance with state actors in an effort to privatize resources or defend the primacy of their claims. All these changes have necessitated structural changes in the institutional set up both at the national and local levels

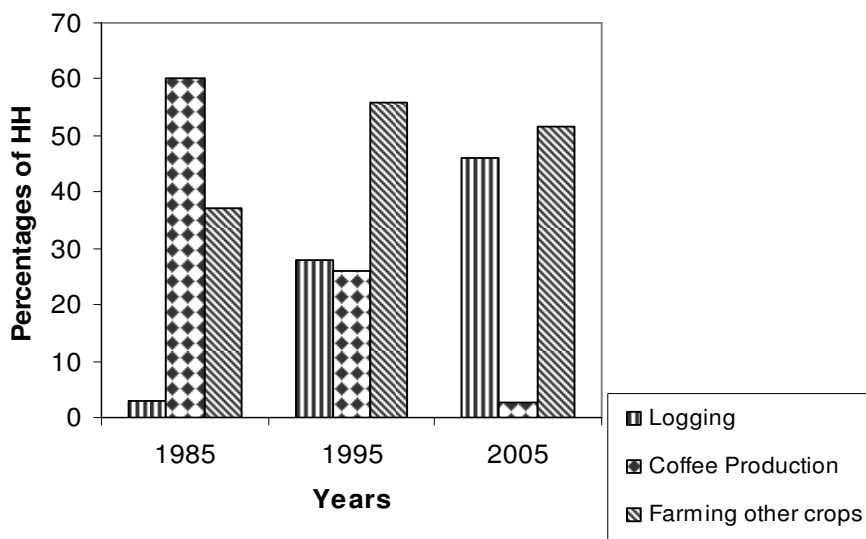


Figure 3: Percentage of household main economic activities in the mountain villages  
Source: Own survey data 2005

### Technological change

Technological change significantly increased the likelihood of institutional change ( $P < 0.05$ ) in the management of CPR by a factor of 4.5. In the mountains villages, the activities of Traditional Irrigation Improvement Project (TIP), which introduced improved land management and irrigation practices, have resulted into increased demand for irrigation water. Figure 4 shows an area under good land management in Mpinji Village where ginger is being produced.

Building of night ponds (*Ndiva*) and the improved land management using terraces and ridges had increased both the areas under irrigation and the intensity of water utilization in the mountain villages. The problem of water utilization is augmented by the increasing number of farmers who cultivate ginger in the mountain villages, a water demanding crop, and on the other side the problem is aggravated by an increasing demand for water in the lowlands for rice production. This increases competition over irrigation water and reduces water flow downstream. The upstream users aim at increasing their gains from ginger and

vegetables while the downstream villages suffer a reduction in water for production of rice. The absence of nested institutions that mediated the regulation of irrigation water between downstream and upstream users under *Mfumwa* system results in the resources use conflicts.

In Ndungu village in the lowland, the construction of irrigation facilities (an intake, and irrigation canals) and the introduction of semi-mechanized farming necessitated institutional rearrangement to allow the irrigation scheme to function properly. This resulted into changes in property right structures of the CPR, and into more dependence on a new organizational setup that did not fit into the local context. The new organization structure needed assistance of experts' knowledge, and involved the costs of maintaining equipment and irrigation canals, and all these meant that the farmers had to pay the costs. The introduction of charges such as tractor charges, water charges and the costs of inputs and labour made operation in the project area not conducive for the poor. The costs were suggested without considering the ability of the poor to pay for the services. Most of the poor were displaced by those with capital to invest in rice farming. The emergence of CHAWAMPYO (*Chama Cha Wakulima Wa Mpunga* Yongoma-Rice farmers association) which took over the running of the scheme shifted the management regimes of the CPR where local farmers were dispossessed of the management and utilization of irrigation water and land for cultivation. This measure led into further impoverishment of the poor segment of the community.



Figure 4: Cultivation of ginger in terraces at Mpinji Village

The introduction of pit-sawing crews from Kisii Kenya and *Kinga*, *Benna* and *Hehe* from Iringa in the pre-independence era, was an important technological breakthrough for the people in the mountains. Over the years, they learned to harvest timber and the value of timber increased overtime. The collapse of coffee economy in these villages in the late

1980s and the beginning of 1990s caused a shift of household economy from coffee to timber harvesting. Agrawal (1999), and Hanna *et al.* (1996) point out that new demand pressures originating from market and technological changes can create different behaviours and incentives about the product to be harvested and the rates of harvesting. They are also likely to influence institutional change and power relations as different sub-groups depending on CPR gain variable levels of access and manoeuvre to consolidate their gains. This calls for a reformulation of resource regimes that will take care of the resulting resource utilization levels and degradation.

### **Distance to the market**

Distance to market measured in terms of time which is a proxy of integration to market significantly influenced ( $p < 0.05$ ) the likelihood of institutional change by a factor of 0.688 and negatively correlates to institutional change. This means that as distance to the markets decreases, the likelihood of erosion of traditional institutions increases, thereby ushering in new market institutions. This can be explained with respect to the location of the mountain and the lowland villages to the nearest markets. In general, the lowland is better connected to the market than the mountain villages. Transportation services are readily available at Maore and Ndungu villages as opposed to the mountains. For example, Mpinji village was found to be more accessible by vehicles than Mvaa village; and the village is therefore better connected to the markets than is the case with Mvaa village. Agrawal (2001) posits out that as local economies become better connected to larger markets, subsistence users are likely to increase harvesting levels because they can exploit the resource for cash income.

### **Transaction costs**

Transaction costs positively correlated to institutional changes ( $\beta = 0.284$ ) with a Wald ratio of 1.086. Although the relationship is not significant at  $p < 0.05$ , an increase in transactional costs is likely to increase the likelihood of institutional change. The factors that increase transaction costs include opportunism or self interest with guile (cheating, withholding information, and asymmetrical information). This can be reduced by social, technical and cultural factors that increase transparency, trustworthiness, honest and honour. This can be achieved by using rules or institutions which make the behaviour of others more predictable.

In Ndungu village, the introduction of a semi-mechanised irrigation scheme generally increased transaction costs of farming in the project area. If one cannot raise enough amount of money to be paid to CHAWAMPYO, (who are charged with the responsibility to collect the money) then he or she cannot be allowed to continue farming in the project area. A usual strategy is to hire it out to those who can pay the necessary costs. The costs needed per season per 0.3 ha include (All figures in TZS):

Tractor charges per Ha	35,0000
Water charges	34,0000
Rotervetor	25,0000

Labour charges	75,0000
Transportation	21,0000
<b>Total</b>	<b>191,0000</b>

At present, regular breakdown of equipment results into delays in farm operations and this leads into a scramble for equipment during peak seasons. As such, those who are well off do corrupt the organizers so as to get the services as early as possible, this makes the poor continue to suffer.

### Dependence on CPR

Dependence on CPR is negatively correlated ( $\beta=-0.377$ ) to institutional change in the management of the resources with Wald ratio of 2.457. The results indicate that as dependence on CPR increases, there is likelihood for institutional erosion whereby local communities devise new strategies to exploit the CPR. Agrawal (2001) asserts that low level articulation to markets, high population pressure and unavailability of substitutes promote high dependence on CPR. Table 3 shows a list of forest products that the mountain community derive for their livelihood.

Table 3: Level of dependence on Chome Forest Reserve by mountain communities

Forest products	Villages			
	Mvaa (n=34)		Mpinji (n=30)	
	Frequency	Percentage	Frequency	Percentage
Water	34	100.0	30.0	100.0
Timber	25	73.5	14.1	47.0
Fuelwood	34	100.0	24.0	80.0
Poles	20	59.0	24.0	80.0
Medicine	30	88.2	22.8	76.0
Forest top soil	16	47.0	16.8	56.0
Fodder	21	61.7	21.6	72.0
Wild fruits	8	23.5	14.4	48.0

Source: Own survey data 2004

Table 3 indicates that there is a high dependence on products from the forest reserve. In Mvaa about 70% of households depend on timber for their livelihood. Water and fuelwood are depended by 100%, while 47% and 56% of the households at Mvaa and Mpinji respectively depend on forest topsoil for fertilizing their farm plots because they (the households) cannot afford the price of industrial fertilizers. Other important products include poles, medicine, fodder and wildfruits.

### Immigration

Immigration has positively correlated ( $\beta=0.22$ ) with institutional changes in the management of CPR with a Wald ratio of 0.587. The results suggest that as population increases, there is a likelihood of an increase of institutional changes through movement of farmers and seasonal influx of pastoralists into the study area, especially during dry seasons, and the movement of farmers during rain seasons. There is also immigration of people to the mountains for the exploitation of forest resources especially timber during

dry season. This has resulted into not only over exploitation of CPR especially forest and water for irrigation, but also a change of people's ideologies with respect to the CPR. In most cases, the in-migrating people do not have a long term interest in the sustainability of the CPR. Their major concern is profit maximization within a short time. In the absence of strong institutional framework and monitoring, the net effect is institutional changes to conform to the market demands.

### **Household size**

The household size which was used as a proxy of population growth, has a positive relationship ( $\beta=0.361$ ) with institutional change with a Wald ratio of 1.418. The increase in the number of people in a household causes an increase in demand for food, water, land and other essential materials from CPRs. This is also reflected in the population density as Figure 5 indicates and also in land fragmentation whereby the results in this study show that 80% of households in all the surveyed villages have a farm size of less than 2 ha of which more than 65% cannot produce enough food for the whole year. Villages in the study area are densely populated. The population is between 344 and 450 persons per  $\text{km}^2$  compared with the national average of 39 persons per  $\text{km}^2$  (URT 2002). As population grows, institutional changes are necessary to cope with the changing utilization patterns. On this, Myers (1989:47) argues that:

“There is hardly any agent more destructive of CPR than the subsistence cultivators who cannot produce enough to eat by cultivating traditional farmlands. This marginal man is inclined to seek his livelihood in marginal lands often forced by forces of political structures, economic systems, and institutional factors, of which he may have little understanding and over which he exercises virtually no influence. The results are widespread deforestation, soil erosion and spread of deserts.”

During the pre-independence era, in Mvaa and Mpinji villages there were areas for pastures and special routes for taking animals to communal pastures (*malira*) in Chome Forest reserve. Due to population increase, together with restrictions to use the forest reserve, land fragmentation has resulted into encroachment and gradual disappearance of these grazing areas.

Figure 5 indicates the population density in the mountain villages as being relatively higher but declining between 1988 and 2002. This is attributed to the decrease in coffee economy between these periods. Most people were reported to migrate to the lowland villages of Ndungu and Maore and even to Tanga and Morogoro regions. In general, the current population density (2002) in the mountains is about ten times (407 persons per  $\text{km}^2$ ) compared with the nation average of 39 people per  $\text{km}^2$ , while the regional average is 103 per  $\text{km}^2$  about four times lower than the population density in the study villages. Over the years, many scholars maintained the thinking that rapid population growth is the major cause of many environmental concerns especially in the developing countries (Mwamfupe 1998). The market forces also have influenced actors' behaviour and the rate of appropriation of CPR particularly water, forest, and pastures.

It can therefore be concluded that the results support the hypothesis that state policies and socio-economic factors have an influence on institutional changes in the study area. This resulted further into increasing resources use conflicts in the study area.

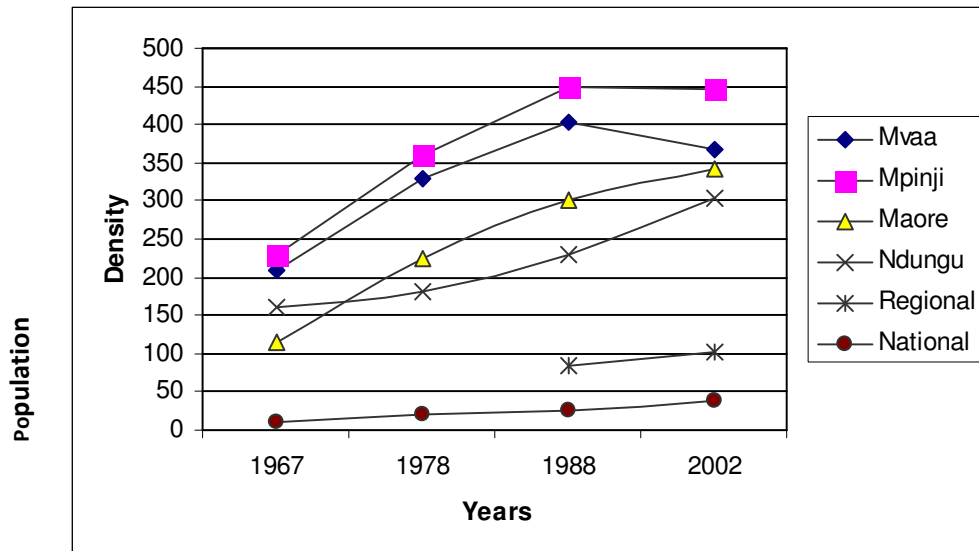


Figure 5: Population density trends (People/km<sup>2</sup>) in the study villages

### Resource use conflicts in the study area

Resource use conflicts in the study area revolve around utilization of shared resources particularly water for irrigation and forest resources as is the case with the mountain communities while in the lowland villages, water for irrigation and pastures are the key resources. Water for irrigation is therefore a crosscutting and critical resource for both mountainous and the lowland communities. In general, stakeholders' interactions under changing socio-economic situations, institutional settings, and power relations are one of the most important aspects that shape the characteristics of resource use conflicts in the study area. Table 4 shows that respondents in all the villages indicated the occurrence of resource use conflicts.

Comparatively, all the people (100%) indicated occurrence of conflict situations in the lowland villages while in the mountain villages 86.7% and 64.7% of the respondents in Mpinji and Mvaa villages respectively indicated the occurrence of resource use conflicts (Table 4). This might be attributed to the influx of people engaged in rice cultivation to the lowland () and also the presence of conflicting land uses especially between livestock keeping and crop cultivation.

### Types and levels of resource use conflicts in the mountain villages

In this paper, resource use conflicts has been categorised with a slight modification based on Glimble *et al* (1994) and Warner (2000) into three categories. Micro-Macro conflicts, those conflicts that occur due to contradiction between natural resource needs



and values e.g. local community livelihood security Vs conservation by government authorities), Inter-Micro micro conflicts (occurring due to lack of cooperation between resource users of neighbouring villages or between indigenous resource users and seasonal immigrant

Table 4: Occurrence of resource use conflicts in the study area

	Frequency of respondents				Total
	Mountain villages		Lowland villages		
	Mvaa	Mpinji	Maore	Ndungu	
Presence of resource use conflicts	n=34	n=30	n=75	n=200	N=339
Yes	64.75% (22)	86.7% (26)	100% (75)	100% (200)	95.3% (323)
No	35.3% (12)	13.3% (4)	0 (0)	0 (0)	4.7% (16)

Source: Own survey data, 2005/2006

or resent settlers) and Intra Micro -micro conflicts (family disputes in resource use due to unequal distribution of resources resulting from power imbalance and breaking of rules and agreements (institutions)). Table 5 indicates the types of conflicts found in the mountains, and summarises the different types of the conflicts occurring in the area and the magnitude of the resource use conflicts.

Table 5: Types, levels and magnitude of resource use conflicts

Types of Conflict	Mvaa (N=34)	Mpinji (N=30)	Maore (N=75)	Ndungu (N=200)
<b><u>Micro-Macro conflicts</u></b>				
Conservation authority vs Local people	64.7 (22)	86.7 (26)	30.7 (23)	27.0 (54)
Local pastoralists vs pastoralists from other villag	NA	NA	25.3 (19)	35.0 (70)
Village vs another Village	NA	NA	5.3 (4)	NA
<b><u>Inter-micro micro conflicts</u></b>				
Small holders vs larger scale farmers (a result of wealth disparities)	14.7 (5)	50 (15)	NA	NA
Local farmers vs seasonal farmers	NA	40.0 (12)	54.7 (41)	47.0 (94)
Local farmers themselves	23.5 (8)	86.7 (26)	69 (92.0)	94.0 (188)
Farmers Vs Herders	NA	NA	92.0 (69)	65.0 (130)
<b><u>Intra –micro micro conflicts</u></b>				
Family rights to resources	35.2 (12)	66.7 (20)	42.7 (32)	36.0 (72)

Note: Numbers in brackets are frequencies and others are in percentage and NA= Not Applicable

Source: own survey data (2005/2006)

### **The Micro-Macro micro conflicts**

The micro-macro conflicts were more pronounced in Mvaa (65.7%) and Mpinji (86.7%) villages. This is attributed to the contradiction between conservation values of the Chome (Shengena) forest reserve and utilization by both local communities and timber traders. The conflict is mainly between local communities and the conservation authorities (in this case the Catchment Forest Project and the District Council Foresters who manages the resources). On the other hand Maore and Ndungu villages respondents indicated less conflicts 30.7% and 27% respectively with conservation authorities mainly the Mkomazi game reserve where this occurs when there is shortage of grazing lands or pasture in their areas therefore forced to take their herds in the Mkomazi National Park. In both Maore and Ndungu village 25.3% and 35.0% of respondents respectively indicated to come in conflict with seasonal pastoralists from other parts of Pangani basin areas, this is due to the presence of the *Maasai* pastoralists who use the reciprocity Maasai institutions to invite their tribal mates and relatives to the area when they run short of pastures or grazing lands. The trend results into increasing the number of livestock in these villages and regular trespassing of animals on farmlands. On the other hand, conflict between neighbouring villages is reported by 5% of the respondents at Maore village. The conflict was a result of upstream–downstream relationship with regard to utilization of irrigation water. This was reported to occur between Maore farmers and the neighbouring Kadando village where both communities utilize the water from the same intake- at Maliranga. Lack of nested institutions to take care of the upstream–downstream water allocation lead to the occurrence of this type of conflicts.

### **Inter-micro conflicts**

The inter-micro conflict which was identified in Mvaa nad Mpinji villages by 14.7% and 50.0% respectively, involved smallholder farmers (farm size < 1 ha) and larger scale farmers (those with farm size>2ha). The cause for the conflicts is based mainly on wealth disparities. The larger scale farmers need more water to irrigate their plots, this means taking many hours, making those with small plots to suffer a delayed water allocation. Delays in water allocations are more prevalent in Mpinji (50%) and less in Mvaa (14.5%), because of the stiff competition in Mpinji village for irrigating ginger as compared to Mvaa village. Another inter-micro conflict was between local farmers and seasonal farmers. This type of conflict was registered only in Mpinji (40 %), Maore (54.7%) and Ndungu (47%) villages. In Mpinji, this is attributed to a tendency for the people who migrated from the mountains to the flood plain to return back to their ancestral land. They do so in order to engage in ginger cultivation which is currently considered to be a rather lucrative business. Thereby, increasing water utilization pressure and exacerbates conflicts among resource users. In Maore and Ndungu villages, seasonal farmers have a tendency to disregard the schedules prepared by WUAs. This can be explained by the fact that there are no control mechanisms to regulate behaviour of seasonal farmers with respect to irrigation water utilization. It was observed during this study that seasonal farmers aim at maximizing profit from their plots, and because they don't have long term interest and attachment to the local communities and that they are not members of any WUA, they easily free ride by violating irrigation rules.

The results (Table 5.5) show that 86.7% and 23.5% of the respondents in Mpinji and Mvaa villages respectively indicated the occurrence of farmer to farmer conflicts. The lower percentage of respondents at Mvaa village can be attributed to low level of integration to market, and the presence of better organized informal and formal local organizations, such as family leaders, elders' council, and the village government, managing the resource use conflicts. Inter-micro conflicts between farmers utilizing water for irrigation in Maore and Ndungu villages were mentioned by 69% and 94% of the respondents respectively. It was further revealed that this type of conflict is caused by violation of irrigation schedules due to the tendency of farmers with larger plots wanting to maximize their production especially when water supply from the mountains is reduced due to increased water utilization upstream or years of rainfall shortage.

### **The intra-micro –micro conflicts**

A larger proportion (66.7%) of the respondents at Mpinji village indicated the presence of resource use conflicts among family members. This was in contrast to Mvaa village with only 35.2%. It was observed that the basis for these types of conflicts is the location of farm plots relative to sources of water or irrigation channels. Water for irrigation is becoming important to most households. Currently, farm plots close to irrigation channels or close to water sources e.g. *Ndiva* are highly valued, and in many cases, contested among family members. The conflicts are also attributed to high population density and un-equal strategic power relations. This poses a great challenge to youths because resources in the mountains are regulated by local institutions that favour or entrust most resources to elders in the family, leaving the young and women at a disadvantage. In Maore and Ndungu villages, this type of conflicts was reported by 42.7% and 36.0% respectively and it occurred between family members with respect to rights to resources. The conflicts occur as a result of breakdown of structural and institutional powers, with respect to resource ownership at a family level. The old property rights system where clans or the heads of the families had institutional and structural powers in decision making on matters of accessing resources is becoming obsolete in the lowland villages as the market forces dominate the scene. It was observed during this study that young people in the families assume more strategic powers and have greater bargaining power as they gain more influence with time by establishing trade networks and increase their financial resources. This trend however, result into intergenerational conflicts.

### **Conclusion and recommendations**

The study shows the trajectory the institutional changes have taken over the past 4+ decades since independence. The changes were triggered by external drivers such as macro policies, technology and markets. Though institutional changes began during the colonial era, major institutional changes emerged in the post-colonial era as a product of the implementation of government policies and administrative directives. The factors which significantly increased the likelihood of institutional changes include political and technological changes, while distance to markets significantly decreased the likelihood of institutional changes. Over the years, the changes contributed to erosion of local institutions responsible for the management of CPR whereby the main underlying principles of social organization such as socio-ecological relations were

altered. Through these changes the upstream-downstream CPRs management which existed during the chiefdom era (*Wafumwa*) was abandoned. This resulted into a mismatch between social and ecological scales of CPR management. The delineation of this socio-ecological system which represented the integration of the social/political and ecological scales resulted into an institutional failure in managing CPR and exacerbated resource use conflicts and degradation of the CPR. As a result of institutional changes, four long term trends that threaten the sustainability of the CPR are revealed. These include:

- i) Conversion of common property into private property and state property regimes, with the consequence of disempowerment of those most dependent on the resources;
- ii) Unsustainable use of the resources through over utilization by the users of the commons due to socio-economic changes, shifting power relations and rising individual self-interest over collective interest mainly due to market forces which resulted into conflicts over the utilization of resources;
- iii) Uncharitable use of the CPR by external users for commercial or subsistence purposes, this is because they don't have long term interest in the sustainability of the resources; and
- iv) Poor communication and coordination among resource users and regulators between the upstream and downstream with the implication of running into the tragedy of the commons.

### **Recommendations**

A better way of managing the CPRs in the study area i.e. forest, water, and grazing lands is to regard the resource system as a complex CPR system that its management should not concentrate in managing individual resources (such as forests, water for irrigation and grazing lands) separately or demarcating small areas for administrative convenience, instead should consider up-scaling it as a complex ecosystem that need a coordinated resource management between the lowland and the mountains. Policy and decision makers at national and district levels should consider putting a provision for managing such resources so as to avoid the mismatch between administrative boundaries and resource systems that has been a source of conflicts, mismanagement and degradation of the resource base. In general, the entry point for institutional change in the management of CPR should vary depending on the circumstances of the local CPR setting and must be carefully selected on a case by case basis instead of using uniform management strategies.

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