Is Joint Forest Management providing attractive Incentives to Local Communities? Empirical Evidence from Uluguru and Udzungwa Mountain Forests, Tanzania

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Abstract

Weak incentives for communities are reported as the primary cause of the high failure rate of Joint Forest Management (JFM) regimes. Reports have indicated that JFM does not pay under protected forests. On the contrary, this paper argues that JFM provides a number of existing and potential incentives to communities living adjacent to forests to facilitate their effective management. The study was conducted in Uluguru and Udzungwa Mountains within the Eastern Arc Mountains in Tanzania. Participatory Rural Appraisal (PRA) tools and a questionnaire were used to gather information while content analysis and descriptive statistics were used to analyse qualitative and quantitative statistics respectively. Existing incentives included; income from tourists and researchers, availability of basic needs obtained by conserving the forest, other climate regulation services, environmental awards, sale of forest products and equipment confiscated from culprits, and individual gain paid for providing various services related to managing the forest. Potential incentives were perceived to include; income from REDD+ payments, payment from water users, hunting rights, alternative income generating projects for households, working equipment, presence of a forestry staff on station, study tours for Village Natural Resources Committee members and income from other ecosystem services. The study concludes that JFM remains attractive to communities living adjacent to these forests due to a good number of existing incentives and perceived benefits. Communities and practitioners are urged to explore additional unexplored opportunities including ecotourism and beekeeping to expand the spectrum of incentives, making JFM more attractive for rural communities living around them.

Keywords: *Existing incentives, potential incentives, forest adjacent communities, Catchment Forest Reserves, JFM, Tanzania*

Introduction

Joint Forest Management (JFM) is an approach that involves the owner of a particular forest to share power with another partner in the management of that forest based on an agreement called "Joint Management Agreement" (JMA). In case of local and central government forest reserves, JFM entails concession of power on the part of the government to enable local communities to plan, budget, control, implement, and evaluate benefit from the forest in a way that is agreed by both parties. Hence, JFM entails one legal owner of the forest on their own free will deciding to surrender some of their powers to another partner to foster better management of the forest (MNRT, 2001). An incentive in this study refers to something that incites or motivates communities living adjacent to forest to participate in the conservation of catchment forests through JFM. More broadly, incentives can be referred as motivation to encourage a particular form of behavior (e.g. forest or soil conservation); it is a temporary stimulus, employed directly or indirectly to encourage behaviour which benefits either an individual or a society (Michaelsen, 1983).

In Tanzania, Catchment Forest Reserves (CFRs) such as the Uluguru and Udzungwa mountain forests are managed for water discharge, biodiversity and soil conservation (MNRT, 2003). Most of such forests in the Eastern Arc Mountains are managed through Joint Forest Management (JFM) by signing JMA between the Central Government and communities, which in most cases are given limited rights with a number of management responsibilities. Harvesting timber and other valuable wood products for domestic and commercial purposes are strictly prohibited. In this way, local communities under JFM are considered 'rightful beneficiaries' rather than 'logical sources of authority and management, which in most cases rests with the government (Wily, 1998). Strict rules on harvesting forest products serve as disincentives to communities that live adjacent to such forests. Incentives for communities to manage forests sustainably exist if there is a sense that the forest belongs to them, either as recognized managers or as recognized owners (Wily & Mbaya, 2001). Communities that are adjacent to forests need to realize greater returns as incentive for their efforts towards protecting and managing the forests (Sangeda *et al.*, 2012). Unless communities realize incentives, their involvement in forest management could be halted in its tracks before it has gathered momentum (Kajembe & Kessy, 2000). A major concern for Joint Forest Management (JFM) in Tanzania is lack of incentives for local communities to participate in controlled and environmentally sound management of forests, especially

in Catchment Forest Reserves (CFRs) within the Eastern Arc Mountain Forests (Sangeda, 2013).

Tanzania has been implementing JFM since 1990s with varying degrees of success (MNRT, 2001). In many cases the institutional aspects, incentive systems, benefit and cost sharing mechanisms for such management regimes are inadequately defined, a feature that threatens the sustainability of JFM (Kearney *et al.,* 1999; MNRT, 2003). Meanwhile, devising mechanisms that combine not only the diverging interests of key actors (including; the international community, forestry services and local communities) but also which take into account various aspects of JFM (economic, institutional, financial, social, cultural and ecological) is a challenging task. Weak incentives for communities are reported as the primary cause for the high failure rate of JFM regimes (Meshack & Raben, 2005). Experience has also shown that under the current legal framework, implementing JFM within CFRs is seriously constrained by the protection status of the forests, which severely restricts harvesting options (Meshack & Raben, 2005). This paper aims to address the question; "*Is JFM providing attractive incentives to local communities for management of forest reserve?*" The paper provides empirical evidence on the existing and potential incentives for communities living adjacent to Uluguru and Udzungwa Forest Reserves located in the Eastern Arch Mountains, Tanzania.

Methodology

The study was conducted within the Eastern Arc Mountain forests in Morogoro and Iringa regions, Tanzania (Fig. 1). These regions comprise the largest area of catchment forests and have a long history of JFM with signed JMAs. Kibangule village which is adjacent to Kimboza FR was selected from Morogoro region while Kidabaga village, adjacent to New Dabaga Ulongambi FR (NDU FR) was selected from Iringa region. Kimboza FR is a lowland forest covering 405 ha situated at 300 to 400 meters above sea level (m.a.s.l.). The forest is composed of lowland vegetation with patches of miombo, *Cedrella ordorata* and *Tectona grandis* tree species, having mean annual rainfall of up to 1800 mm/year. Kimboza is an important catchment forest draining water into Ruvu River, which provides water to Morogoro town, the Coast Region and Dar es Salaam City. The NDU FR covering 3,700 ha is a montane forest with patches of bamboo. The forest lies at an elevation ranging between 1,760 and 2,060 m.a.s.l. (Lovert & Pocs, 1993). The NDU FR receives mean annual rainfall ranging from 1,500 to 2,000 mm/year. Both forest reserves are owned by

the Central Government and managed in partnership with local communities through JMAs.

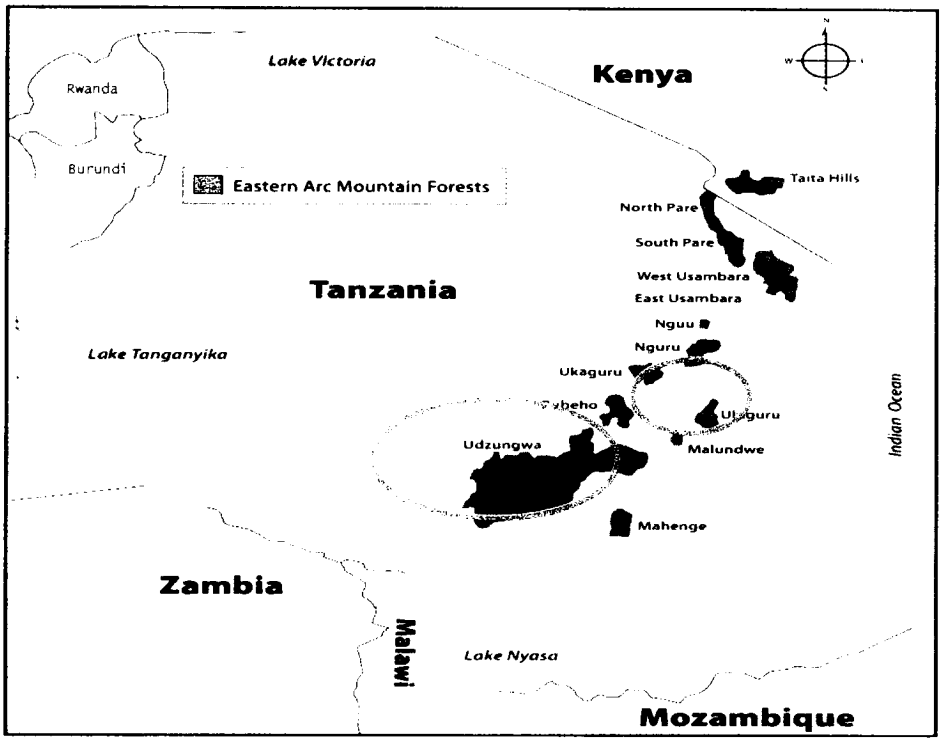

Figure1: Map of the study areas

Kibangile village in Morogoro was dominated by Waluguru ethnic group or tribe. According to village data, during the study (2010), the village had a 1,675 people being 883 females and 792 male residents. Kidabaga village in Iringa was dominated by Wahehe, Wabena and Wangindo tribes. The village had 1,563 people being 847 female and 716 male residents (Village data, 2010). The village leadership administered some of the village land adjacent to the forest reserves but some land remained under clans (Bangati, personal communication at Kibangile village, 2010). The main land use systems include farming, mining, livestock keeping, agro forestry and collecting forest products. The forests also provide a favourable climate for high value crop production (e.g. spices), water and a good habitat for wildlife.

Farming is the main economic activity for the communities living adjacent to th forests and therefore the main source of income. At both sites, the

wellbeing of community members ranges from very poor for villagers who depend on subsistence farming (the majority) to relatively rich people (minority) who practice intensive farming. Their land-use choices and economic livelihood depend on a range of factors such as climate, location, type of food or cash crops and access to markets. Farmers often own scattered pieces of land, usually less than 5 acres per parcel (Sangeda, 2013). In some cases however, farmers rent land from neighbours; often the landowners determine what the tenant should grow. The main crops include maize, beans, rice, banana, vegetables, fruits, potatoes, simsim, sorghum, black pepper, groundnuts, coconuts, sugarcane, sunflower, and cassava. In addition, the community members engage in beekeeping, lumbering, carpentry, mining, livestock keeping, small business, brick making and selling fuel wood, formal employment and providing casual labour. At Kibangile village in Morogoro, mining is the second most important economic activity after farming (Rwamugira, 2007) of which ruby mining is causing the serious problem in the forest. People come from all over Tanzania in search of minerals. As they dig randomly in their pursuit of wealth, they destroy the vegetation (Lovett and Pócs, 1993; Bhatia and Ringia, 1996; Doggart *et al.*, 2000).

This study applied a cross-sectional design to discern the direct and indirect benefits local communities participation in JFM within CFRs. Purposive sampling was employed to select the two regions (Iringa and Morogoro) and districts (Morogoro rural and Kilolo) where the two forest reserves (Kimboza FR and NDU FR) are located. These are government catchment forests, which had been under JFM for a considerable time (since the 1990s). The specific study areas were then selected from two major ecological zones; the lowlands in Morogoro and the highlands in Iringa. Kibangile and Kidabaga villages were selected from among 10 villages due to their proximity to the respective forest reserves. Stratified random sampling was used to select heads of households for personal interviews, following a wealth ranking activity that was done prior to the interviews. Social science scholars have reported that stratified random sampling produces better results than simple random and systematic sampling (see de Vaus, 1993; Bailey, 1995).

A total of 90 households (44 from Kibangile and 46 from Kidabaga village) were selected for personal interviews with household heads using a structured questionnaire. Participatory Rural Appraisal (PRA) tools were used in the field to gather information. The PRA process involved selected village government leaders and village natural resources committee members, men and women. The discussions were conducted in a group of

not more than ten people guided by the researcher using a standardized checklist of questions and issues. This method was used as triangulation to acquire important qualitative information to complement those obtained through questionnaire. PRA tools that were used include; pair wise ranking, wealth ranking and focus group discussions. While PRA offers a creative approach to information sharing it also poses a challenge to prevailing biases and preconceptions about rural people's knowledge (Mikkelsen, 1995). According to Mikkelsen (1995), using PRA, villagers with a minimum level of formal education comfortably participated during the exercises providing the assurance of getting useful information in a relaxed conversation. In the current study these tools promoted interactive learning, sharing knowledge and flexible structured analysis. During pair-wise ranking, existing and potential incentives from JFM were identified. The incentives were paired and compared against each other by asking which incentive was given priority over the other by the community members. Wealth ranking was used to provide a better understanding regarding the well-being of villagers, and the wealth categories within each village.

Data from PRA processes were analyzed thematically at the point of collection in a participatory way with local communities. During pair-wise ranking of incentives, communities were guided to sieve from a larger list of incentives to get the most important ones through scoring. Descriptive statistics was used quantitative data, while content analysis was used to analyze qualitative data to isolate themes and tendencies portrayed in the content of recorded conversations and observations made in the field.

Results and Discussion

Existing incentives

At both sites, results revealed that there were several existing incentives perceived and/or enjoyed by local communities living adjacent to the conservation forest reserves. The existing incentives, which have motivated the communities to participate in forest conservation and management are listed in Table 1.

Table 1: Existing incentives for JFM as perceived by local communities

Region	Village	Existing Incentives
IRINGA	Kidabaga	• Presidential environmental award • Income from beekeeping and other NTFPs • Income from visitors (from within and outside the country) • Income paid to patrol team

MOROGORO	Kibangile	• Income from visitors, tourists (camping) and researchers • Training on forest conservation • Income from fines and sale of confiscated equipments

Source: PRA data (2010)

Existing incentives in Table 1 were further categorized into four groups including:

(i) Incentives due to income paid by various visitors such as tourists and researchers. These were direct cash incentives because the income is paid directly to the community organizations like VNRCs. According to FAO (1987), such payments act as incentives because they compensate individual's time spent in conservation activities.

(ii) Incentives due to availability of basic needs obtained by conserving the forest including water, NTFPs and other climate regulation services. These can be classified as direct (in kind) incentives. They are in kind because they take the form of material goods and services. According to Gregersen (1978), such types of incentives are usually most effective in poor communities because they are straightforward and meet immediate social and productive needs.

(iii) Incentives obtained through various environmental awards, fines and sales of confiscated forest products and equipments of forest offenders/culprits. These are direct cash incentives. They also relate to subsidies (a sums of money given to individuals or communities by the state to encourage them to work in the public interest, Garcia-Pelayo, (1981). A subsidy also includes prizes, bonuses, fellowships and other forms of assistance.

(iv) Incentives obtained through individual gains include; income from daily wage payments from forest patrols, firebreak clearing, commercial tree nurseries and various training opportunities. This is in line with results reported by Vihemaki (2009), that payment for forest patrols, firebreak cleaning and training were among the important incentives, motivating communities to conserve East Usambara Mountain forests.

In an earlier study by Butuyuyu (2003) it was found that prizes, study visits and material support including provision of tree seedlings were the main economic incentives that motivated communities to conserve forests. In Usambara Mountains (also part of Eastern Arc Mountains), Malundo (2008) further reported that capacity building in alternative income generating activities motivated communities to sustainably conserve

catchment forest reserves. Malundo *Ibid* further argued that forest products and ecosystem services from the forests were perceived as incentives for conservation. Incentives due to income obtained from researchers, tourists and visitors have been the most stable source of income in both NDU and Kimboza FRs as shown in Table 2.

Table 2: Entrance fees for various activities in NDU and Kimboza FRs

Forest Reserve	Research entrance fee (TZS/head)	Study visitors (TZS/day/group)	Tourists (TZS/head/day)
NDU FR	5 000	20 000	10 000
Kimboza FR	3 000	15 000	5 000

Note: 1 USD was equal to 1500 TZS in 2010.

According to Lugandu (2010), revenue for the NDU forest reserve from these sources has been increasing from TZS 953,505 in 2003 to 2,600,000 in 2008, which helps to maintain a positive motivational environment for individuals, communities and conservation organizations to conserve forests (Emerton, 1998). However, the same author argues that incentives due to income, only encourage compliance rather than activities that are risk-taking because most rewards are based only on performance, as a result, the sustainability of conservation activities ceases once funding is withdrawn.

In Iringa, communities were proud of winning the Presidential Award on conservation of water sources and tree planting awarded to their village in 2010 (Kasanga, Personal communication, 2010). In Morogoro, communities claimed that benefits obtained through payment of fines and confiscated products were relatively low compared to the actual offences and disturbances observed in Kimboza FR. The two villages had different approaches towards enhancing forest cover. While the plan in Iringa was to plant more trees and enhance protection of natural forests, in Morogoro the plan was to enhance law enforcement to minimize deforestation. These differences in perception on income sources were interesting because as others thought of getting income through enhancement of conservation, others thought of getting the same through fines for continued illegal activities. The differing perceptions on conservation between communities in Kidabaga and those of Kibangile can be traced back to colonial times.

During the British rule in 1914, communities along the eastern slopes of Uluguru Mountains (where Kibangile village is located) refused to adopt conservation interventions such as terraces (Kajembe and Mbeyale, 2010). The protest resulted into several deaths including that of a hero, John Mahenge, after who one street in Morogoro municipality is named. Since

then, farmers in the area have resisted terraces (Mkindi, personal communication, 2010). For similar reasons, they were reluctant to adopt externally introduced conservation measures, which led to major conflicts between them and government organs responsible for enforcing forest regulation, whose impacts are observable until today. The Community's reluctance to adopt new introduced interventions was also reported in East Usambara Mountains in Tanzania (Conte, 2004), as well as in the Peruvian and Bolivian highlands, where communities viewed terrace construction as an outmoded solution (FAO, 1987).

The current study further revealed that income generating projects including camping site and fish farming that were introduced through NORAD support along with JFM, had collapsed in all villages adjacent to Kimboza FR. In contrast, around NDU FR, there was evidence that communities were willing to adopt new technologies introduced during and post colonial time including conservation of natural forests, soil conservation measures along mountain slopes and planting trees outside the protected areas. This practice was evident in Kidabaga village, where village bylaws require every household to plant and manage two acres of trees in their farmlands and the communities complied. As a result Kidabaga village won the 2010 Presidential Award (TZS 3,000,000 and a certificate) on conservation of environment and water sources at the country level (Kasanga, Personal communication, 2010).

Local communities in Iringa, managed to build stronger institutional structures including the village natural resources committees, village leadership and their active participation in various community fora including MVIWATA[9] and MJUMITA[10]. These observations are in line with what has been reported in East Usambara Mountains that, income generating activities, capacity building and institutional arrangements were key incentives for communities to conserve catchment forest reserves (Malundo, 2008).

Results on income accruing to individuals as incentives for forest conservation differed between the two sites. In Iringa, patrol teams were paid some allowances. In Morogoro, payments to patrol teams was not common, hence the teams worked free of charge. This demoralized the teams and they were less effective to protect Kimboza FR; illegal logging

[9] MVIWATA stands for *Mtandao wa Vikundi vya Wakulima Tanzania* which means Farmers Groups network of Tanzania

[10] MJUMITA stands for *Mtandao wa Jamii wa Usimamizi wa Misitu Tanzania* meaning Community Forest Conservation Network of Tanzania

continued. Monetary rewards are good but may in certain situations result in reduced effort (Gneezy and Rustichini, 2000; Fehr and Falk, 2002). This is because introducing monetary payments to communities seems to shift the logic from "moral obligation" to "individual gain". As soon as the shift in motivation is made, paying more seems to work (Vatn, 2008). This means money can represent at least three different logics. It can be seen as a measure of value, a creator of incentives or as a pure compensation. In this study, the focus of payments relies on the second logic (money as a creator of incentives).

Potential Incentives

The study revealed a number of potential incentives from JFM across the study villages. Community perception on potential incentives was different among respondents at the two sites as presented in Table 3 and summarized into four categories thereafter.

Table 3: Potential incentives in JFM as perceived by local communities

Region	Villages	Potential Incentives
Iringa	Kidabaga	• Income from REDD+ payments, • Payment from water services (TANESCO, Mtera and Kidatu Dams, water departments, Industries), • Hunting rights, • Alternative income generating projects for households
Morogoro	Kibangile	• Working equipments (e.g. uniforms, boots, identity cards and bush knives), • Presence of a forester at Kimboza forest station, • Study tours for VNRC members and village leaders, • Income from ecosystem services (e.g. water and carbon)

Source: PRA data (2010)

(i) Incentives related to working gears for the patrol teams or VNRC members. The working gears included transport facilities such as bicycles or motorcycles, uniforms, gum boots and rain coats, identity cards, *pangas*, torches and communication facilities like mobile phones or walk talkies.

(ii) Incentives related to wage payment for patrol teams and training for the VNRC members and village government leaders including study tours to areas with success stories in JFM.

(iii) Incentives related payment expected by communities as payments for carbon credits and water services, permits for collecting and utilizing naturally fallen trees and hunting or trapping crop damaging animals.

(iv) Incentives related to the presence of a government staff (extension officers/foresters) to work in collaboration with the VNRC members on a full time basis.

While communities in Kidabaga required motivation through carbon payments, their counter parts in Kibangile requested working gears and training as motivation for conservation. The demand for REDD+ payments in Kidabaga could be due to sensitization that was done through extension service. Lalika (2006) reported that the availability of extension officers, education and training (study tours and short courses) were regarded as important incentives for communities to conserve biodiversity in the forests in Uluguru Mountain forests. Study tours enable people to learn by seeing followed by motivation to adopt or practice what they saw or learned. During such visits, they learn practically and have the opportunity to exchange views with others. During the 1990s under NORAD and DANIDA support, working gears were supplied to villages in Morogoro and Iringa to serve as motivation for forest patrol teams to work effectively. In addition, VNRC members and village leaders received training and necessary office facilities.

Provision of such facilities currently would be a potential incentive to the as reported in Table 3, payments for environmental services including trading carbon credits through REDD+ and payments for water services were considered as potential incentives that could motivate communities to enhance conservation. The prospect of carbon credits is considered an additional "non timber forest product" which could be exploited by local communities (Skutsch and McCall, 2011). In principle, payments for REDD+ to communities living adjacent to forests will give them an additional source of income and hence an additional reason for them participate in managing the forest sustainably. Such payments could provide new funding and incentives to promote JFM in areas with high biodiversity value if the funds are managed well and used for the benefit of the entire community.

There has been a long standing complaint that local communities had no institutional structures to manage collective funds; but it was observed that communities through their zonal environmental committees were well organized in terms of managing forest resources and finances as they had operating bank accounts. The accounts were managed by the zonal leaders under the close supervision of District Catchment Forest Manager (DCFM). In Iringa for example, the check book for the bank account was kept by the

DCFM who approved transactions that were done by zonal leaders (Lugandu, 2010).

The results in Table 3 further revealed that hunting rights were considered important at NDU FR because they were proposed to reduce problems of vermin, which included; wild pigs, monkeys and wild rats which raid crops in neighboring farms. Several studies in the Eastern Arc Mountains including Lalika (2006) and Vihemaki (2009) reported the presence of vermin as a result of improved conservation in the catchment reserve forests, which was confirmed during field visits to NDU FR. A number of animal traps, animal droppings and animal footsteps were seen in the forest as indicators of the presence of these animals, probably a result of good conservation efforts through JFM. According to Frontier Tanzania (2001), animals within NDU FR had been subjected to a severe hunting in the past (before JFM) with a minimum of 33 set traps per $km.^2$ As a result, many of the larger mammals declined and some were even threatened to disappear from the forest.

Discussion with elders in Kidabaga village revealed that monkeys and wild pigs were hunted freely before JFM and the small number of animals remaining did not threaten their cropland. Nielsen (2006) also found that large mammals like wild pigs and Abbott's duiker were depleted within NDU FR before JFM. He also noted that the number of hunters positively correlated with the village population. Nielsen (2006) found that groups of Red colobus (*Procolobus badius)* had less than ten animals and speculated that it was likely that the small number observed was due to high hunting pressure.

According to the Tanzania Forest Act, number 14 of 2002, (now under review) hunting and trapping activities are forbidden inside forest reserves (URT, 2002; URT, 2009). Possessing or using any trap, snare, net, bow and arrow, gun, poison or explosive substance for the purpose of hunting inside forest reserves without a permit is prohibited (URT, 2002). Even if a person has a hunting license or permit from the Director of Wildlife for the purpose of hunting in a forest reserve, the person must seek and obtain a permit from the Director of Forest and Beekeeping Division to enter the specified forest reserves (Forest Act, 2002 Sections 49(1) (j) and 68(a). Furthermore, the Wildlife Conservation Act, number 5 of 2009 prohibits hunting by using poison or poisoned bait (URT, 2009). The Act also prohibits hunting using dogs or hunting at night by means of a torch, spotlight or other artificial lights. However, observations made in NDU forest reserve revealed that some hunters used snares to trap animals, which

is consistent with findings by Nielsen (2004) who also revealed more serious hunting within the NDU forest reserve using snares, noose traps, pit fall traps, log-fall traps, spike trap, guns, spears and dogs.

At Kibangile village, it was revealed that the absence of a forester in charge in Kimboza was used as an opportunity for illegal tree harvesting. Again, most of the illegal activities were conducted at night. Village patrol teams alone without a forestry staff could not do patrols at night. Even during the day, the patrol teams could not manage to stop and inspect vehicles suspected of carrying illegal logs because they are not accorded the same level of respect as a government forestry staff. Such a scenario reveals the importance of foresters to represent the government down to the village level but it also gives some signals that village patrol team powers were rather limited and weak. The weakness could be due to corruption or low capacity in terms of working facilities. According to Morogoro Regional Catchment Manager, Kimboza FR had been without a forester for some years due to various reasons including insufficient staff in the Forestry and Beekeeping Division of the Ministry of Natural Resources and Tourism.

Communities` Perception on Incentives before and after JFM

Tables 4, 5 and 6 show the number and percentage of respondents, who compared incentives, level of happiness and willingness to participate in JFM before and after its introduction in the study area. Results in Table 4 show that about 60% of the respondents in the study villages agreed that incentives to participate in managing the forest were better under JFM regime compared those before JFM was introduced. However, 18% of the respondents had the perception that incentives under JFM regime were insufficient compared to the time before JFM and about 19% were not sure.

Table 41: Comparing incentives before and after JFM

Forest Reserve	Bad before JFM	The same	Good after JFM	Not sure	Total (n)
Kimboza	5	2	20	17	44
NDU	11	1	34	0	46
Total – N (%)	**16(18)**	**3(3)**	**54(60)**	**17(19)**	**90 (100)**

Table 5: Comparing level of happiness before and after JFM

Forest Reserve	Bad before JFM	The same	Good after JFM	Not sure	Total (n)
Kimboza	1	1	37	5	44
NDU	1	0	45	0	46
Total N (%)	**2(2)**	**1(1)**	**82(91)**	**5(6)**	**90 (100)**

Table 6: Comparing perceived cooperation and participation in JFM Activities

Forest Reserve	Bad before JFM	The Same	Good after JFM	Not sure	Total (n)
Kimboza	1	1	36	6	44
NDU	0	0	45	1	46
Total N (%)	**1(1)**	**1(1)**	**81(90)**	**7(8)**	**90(100)**

Note: Numbers in parenthesis are the corresponding percentages of the total

Many respondents thought that JFM had better incentives, because it leads to sustainable use of forest resources for the benefit of all stakeholders. Through JMAs, communities had rights and responsibilities in the management and utilization of natural forests; and there were bylaws in place to regulate access, which had been prepared and administered by the communities themselves.

The results in Table 5 show that most respondents (91%) were happier following JFM than before. Six percent of respondents (6%) were not sure regarding their level of happiness while (2%) were generally unhappy. Similar trend was observed for respondents who compared willingness to participate and cooperate in JFM (Table 6). Generally, the perceptions of local communities on incentives were positive under JFM because a high percent agreed that there were better flow of incentives under JFM regime and they were happier with JFM than the centralized management regime. For these reasons most of them were motivated and willing to participate in various JFM activities.

Communities' well-being in relation to resources use and governance

Based on well being indicators, there were more poor people in Kibangile (66.6%) compared to Kidabaga village (33.3%). The results show further that the poorer households used more forest resources than richer households. Most poor households use forest products directly for their own livelihood; but they were also used as labourers by middle income and rich families to extract forest products on their behalf. According to these results, forest utilization is gender specific in some cases and generic in others. Hunting is for example exercised by men while weaving and vegetable collection is mainly a function of females. It was further revealed that villagers were the most frequent users of the forest resources at both sites. Nearby villagers (those who did not have management responsibilities) and strangers (those who came from far away) used the forest resources more often in Kibangile than in Kidabaga village. This

reflects a loose local governance structure at Kibangile involving Kimboza forest reserve compared to Kidabaga, where the village leadership and community were more actively is involved in managing NDU forest reserve.

Forest Products and Ecosystem Services

The results further showed that, local communities may also be motivated to participate in conservation if the forests provide goods and services that are important for their livelihood. A number of forest products and ecosystem services were enjoyed by the local communities in the study villages as indicated in Table 7. The Focus Group Discussions showed that climate regulation, water and tourism services were the most direct and positive ecosystem services perceived by the local communities.

Table 7: Forest products and ecosystem services available at NDU and Kimboza Forest Reserves

Region	Village	Forest products	Ecosystem services
Iringa	Kidabaga	Vegetables (mushrooms) Firewood Ropes Grasses for thatching Medicinal plants Fruits Wild meat	Regulation of weather (micro climate) Biodiversity conservation Climate change mitigation Water Tourism
Morogoro	Kibangile	Medicinal plants Fire wood Large and small animals and reptiles Vegetables Poles and withies Strings and ropes for building Timber (logs) Weaving materials for making mats -(*nemvu*) Wild potatoes for food in dry season Wild fruits Minerals (alluvial gold-mined in FR)	Climate regulation service (micro-climate) Water for domestic use and irrigation Biodiversity conservation Research and tourism Camping sites Rainfall

Forest products that were obtained from catchment forest reserves within the study area included honey, firewood and vegetables. Other products were; medicinal plants for treating various diseases, grasses were used for thatching houses and as fodder. Stones, timber, poles and rope were used for house construction. Wild meat, fruits and mushrooms were used for food while various grass (*Milulu* in Iringa and *Nemvu* in Morogoro) were

used for weaving mats and baskets. Illegal activities involving trapping and selling blue lizard dwarf gecko (*Lygodactylus williamsi*) were observed in villages adjacent to Kimboza forest reserve, where mining for alluvial gold along the Ruvu River was also prominent. These activities were illegal in the forest reserves *de jure* but they were *de facto* important sources of income especially for young men as also reported by Rwamugira (2007). Based on the ranking scores of different forest products in the two villages, medicinal plants and honey were given the highest priority.

Conclusion

Based on these results, it is concluded that JFM is still a plausible intervention for communities living adjacent to catchment forest reserves. Currently, there are many tangible incentives that motivate communities' participation. In addition, there are various potential incentives which are not yet explored fully by the communities although they are of high value. It is therefore recommended that communities living adjacent to areas with high forest biodiversity values should explore the possibility of using non-timber forest products and forest ecosystem services like carbon markets, ecotourism and beekeeping activities to enhance their incentive packages. These are crucial for increasing the motivation of communities to remain engaged actively in JFM activities.

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