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Institutional arrangements and collective action: evidence from forest management in Zimbabwe

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ABSTRACT

This study examines the emergence and development of collective action and institutional arrangements in forest communities in Zimbabwe. The research adopted a qualitative approach using 87 key informant interviews and 1054 questionnaires administered to randomly selected households from deforestation hotspots in five districts. Based on a theoretical concept that collective action depends on resource system characteristics, actor networks, institutional arrangements and the external environment, the study explored patterns in the emergence of collective action. The study further explored actor networks to illustrate applicability of Social Network Analysis (SNA) as a proxy of collective action and institutional arrangements. Results suggest that actor networks reflect the existing strength and intensity of collective action and institutional arrangements. Forest tenure has a bearing on the intensity of collective action. Forest resources under state management, though more productive in terms of goods and services than those under communal management, have a low capacity for collective action and the emergence of new institutions. Results suggest that a high diversity of actors relates to a high intensity of collective action and an emergence of new institutional arrangements. These findings have a bearing on policy and forest management strategies for forest resources under community and state proprietorship.

KEYWORDS

Collective action; institutional arrangements; forest resource management; communal forest; zimbabwe

Introduction

Forests provide environmental goods and services, food security, income and jobs through the sale of timber and non-timber forest products (Berrahmouni et al. 2015). However, management of forest resources is associated with complex dynamics related to social, economic and political considerations (Bugembe 2016). The deepening poverty and food insecurity levels increase the dependence of rural and urban communities on forest resources (Pritchard et al. 2020).

Depending on ownership arrangement, forest resources management is a collective process involving different stakeholders. In communally and state-managed forests, local communities often work with state organisations to manage the forest. Different models for managing forest resources have emerged over the past decades (McDougall et al. 2008). Some models have very limited scope for including local people particularly in protected areas (Lekgau and Tichaawa 2019), while others increasingly embrace participation of local communities and private actors in forest management (Wegi and Eshetu 2019). It is through participatory models such as adaptive collaborative management (ACM) that the importance of collective action has been realized in forest resources management (Evans et al. 2020).

Collective action occurs in several forms, ranging from a few individuals acting on their own (Ostrom 2004; Devaux et al. 2009) to large groups or organisations volunteering to contribute their efforts to pursue common interests or achieve common objectives (Devaux et al. 2009; Gyau et al. 2014). Collective action is operationalized through institutions, which are defined as conventions, norms and formal rules of the society that guide how members derive benefits from the resource at the same time, making it available for others to benefit (Ghorbani and Bravo 2016; Badola et al. 2018).

While the role of institutions in conservation and forest management is well understood (Ludvig et al. 2018), modifications in the forest resource and addition of new actors can lead to emergence of new and different institutional arrangements with unforeseen consequences on forest management and for local communities (Badola et al. 2018). There is evidence from literature that new institutions can emerge through bricolage or modification of already existing institutions, resulting in new institutional conditions that may enable actors to capture an existing opportunity (Cleaver 2017; Hounkonnou et al. 2018; Sakketa 2018).

Social network analysis (SNA) has gained popularity as a tool for identifying how different categories of actors interact in collective action scenarios (Calvet-Mir et al. 2015). Since networks reveal structure and relational patterns of actors, social scientists can use various SNA tools to deduce complex social dynamics and trends from such interactions (Wang et al. 2018). Networks have been used in social science research and project management to describe institutional arrangements. A network reflects the formal relationships between actors as well as relatively informal practices that constitute the network structure (Wang et al. 2018). For example, SNA can show hidden or less obvious ownership arrangements of a resource system by revealing dominant actors in that network.

This paper provides evidence on existing institutional arrangements and how they relate to emerging forms of collective action. Secondly, it explores SNA as a tool to improve understanding of the connectedness between actor networks and institutions, thus contributing to the methodological approaches to the study of institutions (Olivier 2018). Our methodology is underpinned on the understanding of institutions as a product of formal and informal networks (Wang et al. 2018). This study aimed to establish how existing locallevel dynamics have a bearing on various institutional and collective action arrangements for forest resource management in communally managed forests. Specific objectives were to (i) identify patterns of forest resource use in five districts of Zimbabwe, (ii) identify existing forms of collective action and institutional arrangements in the forest sector and (iii) analyse how existing networks of actors relates to the emergence of collective action and institutional arrangement.

Conceptual framework

To assess existing collective action and institutional arrangements in communally managed forests, we applied the framework by Agrawal (2001), which outlines four important conditions required for collective action, namely (i) resource system characteristics; (ii) group characteristics; (iii) institutional arrangements and (iv) external environment.

Co	ndition	Indicator	Source of information (this study)
(1)	Resource system characteristics	 Productivity of the system Size of the resource system Technology elements 	Questionnaires and Key Informant Interviews
(1)	Group characteristics	1) Typologies of collective action 2) Social networks of actors	Key Informant interviews
(1)	Institutional arrangements	1) Locally devised access and management rules	Key Informant Interviews Secondary literature
(1)	External environment	 Appropriate levels of external aid to compensate lo users for conservation activities Policy and governance framework Past successful practices 	ocal Key Informant Interviews Review of secondary literature

Table 1. A framework for assessing collective action and institutional arrangements.

(Source: Agrawal 2001).

We identified indicators for each condition of collective action that best suit our study from those by Agrawal (2001) and used SNA to indicate the intensity of existing collective action in each case (Table 1).

Resource system characteristics relates to various ecosystem goods and services and the distance travelled by local community people to access them (Agrawal 2001).

Group characteristics relates to how different user groups act collectively by interacting with each other in the management and use of communally owned forest resources. We identify the different typologies of collective action and existing patterns of networking among actors and assess them using SNA. We then show how SNA relates to collective action using three commonly used centrality measures in SNA, namely betweenness, degree and closeness centrality (Sarkar et al. 2018).

We categorize institutions into formal and informal where formal institutions are 'rules that are readily observable in terms of positions, such as authority or ownership' (Wang et al. 2018, p. 21). Informal institutions encompass the actual conduct of actors including social norms, traditions, customs, taboos, codes of conduct and routines (Scott 1981; North 1990). Previous successful projects and appropriate levels of external aid to compensate local users for conservation activities, as identified by Ostrom (2011), were used to assess the role of the external environment on existing collective action and institutional arrangements.

We proceed to apply the conceptual framework to answer our research question: how do local-level dynamics and actor networks relate to institutional arrangements and the emergence of forest management collective action in Zimbabwe?

Methodology

Study context

Five districts were selected for this study (Gokwe South, Lupane, Hurungwe, Muzarabani and Gwanda) as strategic in terms of past and ongoing forest management interventions. Forests in these districts range from gazzetted (Gokwe South and Lupane) under the Forest Act (19:05) to communal (Hurungwe, Muzarabani and Gwanda). Local people have free access in communal forests, while access in gazetted forests is limited. Gokwe South and Lupane are located in the fragile Kalahari sand ecosystem and host some of the largest gazetted forests in the country. These forests have been at the centre of conflicts between the state and the local people for many years (Mudekwe 2017). Hurungwe and Muzarabani districts are among major tobacco-growing districts in the country, a crop closely associated with high levels of deforestation (Nyambara and Nyandoro 2019). Gwanda district (predominantly dry) is well known for livestock ranching .

Methods

The study used a mixed methods approach that integrated key informant interviews and questionnaire surveys, as the first approach, to interpret trends in forest resource use and indicating how these relate to existing institutional arrangements and collective action. The second approach applied SNA to build and visualize the network of actors in the study sites and by calculating the metrics for the relevant network indicators i.e. betweenness, degree and closeness to show the intensity of collective action in forest resources management in the study sites.

Betweenness is a measure of the extent to which an actor lies on the paths between others (Newman 2005). It portrays 'the extent to which an actor has control over information flowing between others' (Newman 2005). Degree shows the number of other actors that an actor is directly connected to. It is regarded as a measure of importance in network analysis (Borgatti and Everett 1997). Closeness indicates how an actor is positioned in relation to other actors in a network. An actor with high closeness value sits on shorter paths (geodesic distance) between two other actors (Borgatti and Everett 1997).

Intensity of collective action was perceived on the basis of high centrality values for the SNA indicators that were significantly different (p < .05). Following the approach by Yang (2021), a network of actors in each of the 5 districts was constructed for analysis.

Data collection

Data was collected using a combination of interviews and questionnaires following a purposive sampling approach targeting 23 deforestation hotspot in 5 districts. Key informant interviews were used to identify deforestation hotspot areas. Deforestation hotspot areas were defined as areas known for forest-related crimes and disputes by key informants. Questionnaires were randomly administered to 1054 households in the study sites. Eightyseven key informant interviews were conducted with selected individuals in the community, government agencies and non-governmental organisations (NGOs) following a snowballing technique. Interviews elicited network data, as well as types of organisations involved in forest management in study wards, while questionnaires mostly focused on demographic and institutional data related to gender roles, land ownership, existing arrangements and patterns of forest resource use. Table 2 shows the sample data and study site profiles.

Data processing and analysis

SNA was used to build and visualize the network of actors in the study sites. Key informants mentioned the organisations that they work with in forest management and forest related programmes. The data was coded and translated into SNA language using Gephi 0.9 software package . The software was also used to present the data in graphical form and individual metrics for SNA indicators selected. The metrics were then subjected to a Kruskal- Wallis

District	Gokwe South	Muzarabani	Hurungwe	Lupane	Gwanda
Organisations	24	19	22	32	20
Hotspot wards	4	3	4	3	9
Wards in District	33	29	26	28	24
No. households	5 442	5 575	7 374	1 589	9 335
Questionnaires	219	224	214	157	240
Sampling %	4.0	4.1	3.9	2.9	4.4
Proportion of males(%)	68.4	64.9	50.0	66.8	61.8
Proportion of females (%)	31.6	35.1	50.0	33.3	38.2
Interviews	18	17	19	18	15

Table 2. Sample size and profile of the study sites selected for data collection.

one-way analysis of variance (ANOVA) because the data was not normally distributed. A Bonferroni-corrected Wilcoxon-Mann-Whitney test was used to determine the significant differences of the pairwise comparisons at a 95% significance level.

Results

Resource system characteristics

Local perceptions on availability of forest products

Respondents indicated that availability of some forest products in community forests was decreasing (Figure 1). Gwanda had the largest proportion of respondents facing critical shortages of certain forest products such as edible insects, poles, small game and wild fruits, while in Gokwe South and Lupane, firewood was not among scarce products. In Matabeleland South, edible insects such as mopane worms were becoming less available most likely due to overharvesting.

Sources of firewood

Firewood was obtained from community woodlots complemented by own woodlots and other sources, except in Lupane district, where community woodlot was the only source of firewood (Figure 2). In Hurungwe, more respondents (53%) obtained firewood from own woodlots than those who obtained from community forests (47%). For all the districts that indicated own woodlots as firewood sources, Gwanda had the least number of respondents (4%). A fairly large number (20%) bought firewood from firewood vendors. Gwanda and Lupane have only a few household woodlots. Although Gokwe South is predominantly not a tobacco-farming district, some commercial farms have established their own woodlots where they obtained firewood.

Distance to the nearest forest

In Muzarabani district, most respondents travel short distances (<2 km) to nearby forests, while for Gwanda, Gokwe South and Lupane, they travel longer distances (≥ 6 km) to access forest resources (Table 3). Community forests that can provide firewood and other goods and services for rural communities in Gwanda, Hurungwe and Lupane are ≥ 10 km away. For Lupane and Gokwe South districts, major sources of firewood are gazetted forests, which are situated away from communities.

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Figure 1. Community perceptions of forest products availability in five districts of Zimbabwe.



Figure 2. Firewood sources for communities in five districts of Zimbabwe.

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Distance to forest	Gwanda	Muzarabani	Gokwe South	Hurungwe	Lupane
<2 km	-	+	-	-	-
2–5 km	-	-	-	-	+
6–9 km	+	-	+	-	+
10 km or more	+	-	-	+	+

Table 3. Estimated	distance to th	ne nearest communi	ity foi	rest in t	five districts.
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+ or - sign shows majority or minority of respondents, respectively.

Group characteristics

Typology of collective action and institutional arrangements in forest resources management

We identified four types of collective action, which emanate from various partnership arrangements between the local community and other actors, including the statemandated institutions, private organisations and NGOs. State-mandated institutions play an overarching role in most of the existing forms of collective action. The role played by private organisations and NGOs was more pronounced in two districts where collective action is mostly associated with financial benefits as an incentive.

The first type involved private-public partnership for tree planting and woodlot management (T1). One such example is the woodlot establishment and management scheme under the Tobacco Wood Energy Programme (TWEP) in Hurungwe and Muzarabani districts. The major actor supporting this type of collective action is Sustainable Afforestation Association (SAA), a private organisation responsible for afforestation activities in tobaccogrowing regions of the country. Together with SAA, other private tobacco companies support communal farmers in establishing woodlots of *Eucalyptus* species and other fastgrowing trees as a way of reducing the impacts of tobacco driven deforestation. Under this public-private partnership, over 40,000 ha of fuelwood plantations have been established over the past 5 years. While various models are in use by different companies, the SAA model (the major contracting company for tree planting) involves a long-term lease of land from participating farmers who are then entitled to various forms of support, including access to a share of fuelwood for use in curing tobacco. Other separate programmes identified in the study include national tree-planting programmes jointly implemented by the state together with local communities, schools and the private sector.

The second type is a joint venture between Carbon Green Africa (a private company) and four RDCs together with the local communities in Hurungwe district (T2). The venture was established to implement a Reducing Emissions from Deforestation and forest Degradation (REDD+) project in 2011. The parties to the project also known as Kariba REDD+ are sustainably managing the forest for sale of carbon credits under the voluntary market. The project established and trained community-based fire monitoring teams. In addition, Carbon Green Africa provided financial support for bee keeping, nutrition gardens and conservation farming projects.

The third type of collective action, which was found in Gokwe South (beginning in 1993) and Lupane (year not established), is the management of gazetted (protected) forests by the state in partnership with local communities and NGOs (T3). Under this type of collective action, the forest belongs to the state. Some portions of the forests have been invaded by local communities and converted to cultivation areas and settlements. In Gokwe South, the

implementation of this type of collective action in the early 90s resulted in the establishment of community forest management groups known as Resource Management Committees (RMCs). However, most of the RMCs were no longer active due to various reasons to be discussed later. In Lupane district, the collective action for the management of Ngamo and Sikumi forests benefitted from the Hwange Sanyati Biological Corridor Project (HSBCP) that included the state and local communities to enhance the sustainable management of forest biodiversity through institutional capacity building.

The fourth type of collective action is based on community-led initiatives for managing natural resources. These exist in all 5 districts as an initiative of small groups of community members with support (in some cases) from NGOs and government departments (T4). One such example was the Manketti Farmers group in Lupane, which was established with support from the Forest FORCES project in 2015 to sustain household incomes and livelihoods through value addition of forest products and sustainable management of trees. The group produces a wide range of skincare products from manketti (*Schinziophyton rautanenii*) seed. As a way of ensuring sustainable supply of seeds, the group started planting trees and raising awareness on forest management in the local community with support from Forestry Commission and Food and Agriculture Organisation (FAO).

Networking patterns within the collective action types

SNA revealed different networking patterns among actors involved in different collective action types. For Hurungwe and Muzarabani,which are mostly implementing the first type (T1) of collective action involving management of woodlots under TWEP, SNA showed similarities in the pattern of networking showing intermediate to high intensity of networking (Table 4). Furthermore, Hurungwe district has more collective action types than Muzarabani (and all the other districts) and higher intensity of collective action.

Significantly, high closeness (p < .05) for Muzarabani and Hurungwe implies that these two districts have more actors who are easily accessible to other actors in the network hence higher dissemination of information to other actors. The two districts, however, differed significantly (p < .05) in terms of degree centrality, which was higher in Hurungwe than Muzarabani. A graphical overview of the networks for the two districts indicated that in terms of composition of actors, these two districts have the highest number of private sector organisations supporting collective action in forest management, a characteristic which adds to their similarities (Figure 3).

Table	4.	Collective	action	types	showing	three	SNA	indicators	(degree,	closeness	and	betweenness)
across	th	e five stud	y distrio	cts.								

			SNA indicat		
District	Collective action typology	Degree	Closeness	Betweenness	Networking intensity
Hurungwe	T1; T2; T4	71.05ª	79.55ª	53.73ª	High
Muzarabani	T1; T4	51.32 ^b	68.58ª	55.71ª	Intermediate
Gokwe South	T3; T4	52.50 ^b	42.85 ^b	55.46ª	Low
Lupane	T3; T4	59.86 ^{ab}	39.36 ^b	66.14 ^a	Intermediate
Gwanda	T4	59.48 ^{ab}	78.10 ^a	60.75ª	High

*Means marked with same letter in the same column are not significantly different (p < 0.05) from each other



Figure 3. Graphical presentation of formal and informal networks in the study sites as presented through closeness centrality. The size of the node is proportional to its closeness centrality.

For the districts that are implementing the third type of collective action (T3), such as Gokwe South and Lupane, there were no significant differences (p > .05) in degree and closeness centralities for the networks. In both districts, collective action is driven by the same state agent (Forestry Commission), which has a central role at the core of the network with several other actors at the periphery.

Community-led collective action (T4) is a cross-cutting type and the only type of collective action in Gwanda district showing a high intensity (high closeness and degree centralities). Due to its capacity to provide direct financial support for collective action to other actors (including government agencies and community groups), this type tends to have high closeness centrality in a network. There were no significant differences (p < .05) for closeness between Gwanda and Hurungwe and Muzarabani, which have high and intermediate intensity of collective action, respectively.

Institutional arrangements

Informal institutional arrangements related to collective action and forest management Household-level institutional arrangements included gender roles for firewood collection, mode and frequency of firewood collection. Respondents from Lupane, Gwanda and Hurungwe indicated that women mostly collect firewood, although men can also be involved in the activity, especially in Gokwe South and Muzarabani. In Gokwe South and Gwanda, children are involved in firewood collection more than adults in some cases (Figure 4). For example, in Gokwe South, children are more involved than adult women, while in Gwanda, children are more involved than adult males. The trend shown indicates that firewood collection largely remains a role for women, although due to circumstances unique to different study sites, men and children are also becoming more actively involved.



Figure 4. Responsibilities for firewood collection in five districts of Zimbabwe.

Most of the firewood collection is by head stacks, a practice most associated with women (Figure 5). For Gokwe South, the most common mode for firewood collection was the scotch carts, which is often associated with long distances and mostly done by men. Key informant interviews also confirmed local rules and social norms that govern local communities' access to forest resources particularly in state-managed forests in Lupane and Gokwe South districts. Communities are only allowed to collect deadwood from the forests on specified days of the week. In Gokwe South district, RMCs determine the arrangements with Forestry Commission, while in Lupane district, access is granted once a week on Thursdays mostly to women and girls. Local communities are also allowed access into the forest to collect thatch grass under a permit system, which is administered by Forestry Commission in Gokwe South and Lupane. In Lupane district, Forestry Commission further allows local communities access to livestock grazing into the forest up to 2 km.

Formal institutional arrangements related to collective action and forest management There were different collective action arrangements for forest resource utilisation and management, with most of them related to communal ownership of forest resources. However, there are some modifications in cases where public-private partnership arrangements are involved.

In the two tobacco-growing districts of Hurungwe and Muzarabani, individual farmers and farmer groups involved in tobacco farming are required by law (SI 116 of 2012) to establish tobacco woodlots for curing tobacco under contract arrangements with tobacco merchants. Where the state is involved in establishing these woodlots in partnership with

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Figure 5. Mode of firewood collection in five districts of Zimbabwe.

the farmer, ownership of the established woodlot remains with the farmer from the onset. However, for those woodlots that are established in partnership with some private companies and tobacco merchants, the farmer leases the land to the private company for a period equivalent to three harvesting rotations of the woodlot (a period ranging from 18–21 years for eucalyptus woodlots). During this lease period, the private company or tobacco merchant owns the woodlot, with the farmer having access to the firewood to cure tobacco on agreed terms between the company and the farmer.

Community groups involved in the value addition of Non-Timber Forest Products (NTFPs) for commercialisation from a communally owned forest are required to obtain a harvesting permit from a local authority or the forest authority. This applies to a number of community groups and individuals, which include those who make wood artefacts (curios), furniture and other non-timber forest products for sale. Collection of forest products for household use is free for community members under the oversight of the headman or other persons or committee with delegated authority.

In Hurungwe district, the institutional arrangements for the Kariba REDD+ project include long-term lease (30 years or more) of vast portions of community forests (about 785,000 hectares). Although the land remains under communal tenure, local people can no longer harvest the trees or conduct any activity that reduces the capacity of the forest to effectively absorb carbon from the atmosphere. What local people miss in physical goods from the forest is supposed to be compensated by the income from the sale of carbon credits and socio-ecological benefits from the forest.

External environment

Past and ongoing interventions related to forest resources management

From an external environment perspective, 10 projects related to collective forest resources management (supplemental file1) have been implemented in the past showing that a diversity of organisations play an important role in supporting collective action both in the community and national scale. The list is limited to projects directly related to community forests, implemented from soon after Zimbabwe's independence in 1980 to 2021.

Rural afforestation programme phase I (RAP I) was implemented between 1982 and 1989 to address challenges of a declining forest resource base due to deforestation in rural communities. While the project involved local communities in establishing woodlots of exotic fast-growing species (mostly *Eucalyptus*), the model adopted for RAP I was a state-driven approach of central nurseries run by Forestry Commission to raise seedlings for distribution to local communities for tree planting.

The Resource Sharing project, which was implemented by Forestry Commission and the local community of Gokwe South District in 1993, played a major role in transforming the dominant model of forest management in Mafungautsi gazetted forest. The pilot project established RMCs, which were responsible for formulating forest management plans to cater for various forest management aspects such as fire monitoring and management, firewood collection and thatching grass harvesting by local communities among other aspects. Although over time the, effectiveness of the RMCs was weakened due to lack of adequate support from Forestry Commission, they continued to exist up to date and efforts are underway to revive them following a cabinet resolution issued under the new dispensation [of the Zimbabwean Government]. According to a key informant from Forestry Commission:

The current work plan for the year 2021 targets to establish 610 Natural Resources Management Committees throughout the country including the already existing RMCs in Gokwe South (**Key Informant, Forestry Commission, 18, February, 2019**).

The ACM project driven by the Center for International Forestry Research (CIFOR) began in 1999 as a pilot project to improve institutional arrangements for protected forest management in Mafungautsi forest. The administrative structures that were set by the project worked well during its lifetime but began to collapse a few years after its end in 2003 due to lack of adequate support from the state.

Discussion

This study began by hypothesising that existing local-level dynamics have a bearing on various institutional and collective action arrangements for forest resource management in communally managed forests. Here we discuss how existing patterns of resource use and local dynamics in the five districts impact collective action.

Local forest resource use patterns and collective action

Results suggest that nearby forests (within 2 km distance from households) are decreasing in both abundance and capacity to provide adequate goods and services. Jalonen et al. (2018) indicated that deforestation and forest degradation affect the availability of forest products, resulting in more pressure on the available forests (which may be far away), pushing forest-dependent people to travel long distances to collect the resources. However, this promotes free-rider tendencies from those who feel less responsible and less affected by the negative consequences of forest degradation in specific localities (Niemiec et al. 2020). Forest products provide an incentive for actors, particularly local communities to engage in collective action (Ros-Tonen and Wiersum 2005). Local people are more likely to be willing to manage forest resources when there are tangible benefits from the forests (Pritchard et al. 2019).

Communities living around protected forest areas graze their livestock; collect firewood and thatching grass from the forest. However, these activities are monitored by forest rangers for compliance with set guidelines, which prohibit cutting down trees and getting into the forest beyond certain stipulated distances.

In Lupane and Gokwe South, illegal settlements and cultivation in gazetted/state forests are defining a new trend in the management of gazetted forests. Since their gazetting between 1926 and 1960, gazetted forests have been a source of conflict between the state and local communities. These conflicts have resulted in the gradual loss of significant portions of forestland through illegal settlements and cultivation. Mafungautsi forest, which was gazetted in 1954 with 101,900 hectares of forests, has lost over 22,000 hectares since 1980. Gwaai forest in Lupane also lost 15,759 hectares (11%) of the gazetted 144,230 hectares in 1930. Because of these social dynamics leading to the occupation of gazetted land, state authorities are contemplating evicting forest occupants, a development that is likely to worsen already strained relations between the state forest authorities and local communities. The resultant effect is a likely change in the way local communities access forest resources and the introduction of more stringent conditions for local people whose livelihood depend on forests. Such changes are likely to be detrimental to institutional changes that have emerged from past interventions, for example under the RMCs in Mafungautsi.

Types of collective action and institutional arrangements in forest resource management

There is potential to strengthen collective action using resource system characteristics that allow actors to realise a good return on investment in reasonable time. The woodland management programme by SAA has focused on fast-growing species such as *Eucalyptus* because of their perceived ability to offer a return on investment in shorter time compared to woodlots of native species. This provides an incentive for the organisation and the farmers to engage collectively in managing woodlots as they would be assured of realising tangible benefits from collective action. In contrast, state-driven community forest management does not offer many incentives for collective action (Saeed et al. 2017).

The interventions by private sector and NGOs in forest management introduced new dynamics to old institutional arrangements of resource use, ownership and access rights. For example, the REDD+ initiative in Hurungwe district shows that the whole community was able to collectively benefit from the proceeds of carbon credits, thereby eliminating collective action problems of a few people accessing more benefits than others. The community previously benefitted from forest resources such as timber and firewood mostly at individual household level. An institutional arrangement brought about by REDD+ also eliminates free-rider problems normally associated with collective action involving large groups, especially at district level (Agrawal and Angelsen 2009).

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Social networks in the context of collective action and institutions

SNA results largely agree with literature in terms of existing institutional arrangements in the study areas. In localities having state protected forests, institutional arrangements in favour of a state regime structure take precedence over a communal-oriented institutional arrangement structure (Mandondo et al. 2008). Furthermore, SNA demonstrated that from an actor-network perspective, more government-affiliated actors are positioned at the core of the networks in all the study sites, with a few being found at the periphery together with private agents and a few NGOs. State organisations, though less than community-based organisations and NGOs, have more influence on how forest resources are managed and therefore to a greater extent define the resultant institutional arrangements. State agencies are strategically positioned within reach of any other actor in the network because of high closeness.

Drawing lessons from past interventions to inform the emergence of collective action

Lessons from the past projects have informed collective action largely. For example, the first activity of the Resource Sharing project in Mafungautsi was 'to test co-management as an alternative to exclusionary state control' (Mandondo et al. 2008). This project established community structures that, despite challenges over time, are still implementing collective action (Mujuru 2021). Although donor-driven projects such as the ACM in Gokwe South in the late 90s had a strong scope of collective action, their impact weakened with time due to a lack of institutional support and favourable policy frameworks from the state (Mutimukuru-Maravanyika and Almekinders 2011). Murombedzi (1990) highlighted that community-based natural resources management (CBNRM) approaches, which have been implemented over the years, were merely geared toward luring communities into managing forests, but there is no favourable policy framework to reward the communities for their efforts. However, the emergence of recent institutional innovations on forested landscape management such as REDD+ and other management interventions that aim to provide incomes at household and community levels are a promising development, for collective action.

Conclusion

Results showed that fuelwood shortages depend on locality and type of actors. Communities around gazetted forests do not have firewood problems, although they have to travel long distances to get the resource. Results suggest that actor networks have important institutional attributes for collective action arrangements for forest resource management. The potential and emergence of collective action varies from one study area to another, with forests managed under communal tenure having higher potential for collective action and more diverse institutional arrangements than forests where state ownership is the dominant institutional arrangement.

Our results point to a need for policy shift concerning management of forest resources in communal areas, particularly those under state-dominated regime in order to open up institutional space and improve interactions among actors. New strategies to enhance community access to forest management-based incentives are critical for sustainable forest management as demonstrated under public-private partnership arrangements in some of the districts. The declining forest productivity particularly in communally managed forests is one major setback for collective action. The local people end up travelling long distances to forests where the propensity for them to act responsibly and collectively reduces as they go further away from their home. In state regime managed forests, the institutional arrangements are weak in terms of providing enough incentives for local communities to be more willing to collaborate with the state in collective management of forest resources. Past interventions from projects such as Forest FORCES and RAP provide important lessons that can inform the advancement of collective action in the forest sector. This is demonstrated by new woodlot ownership arrangements by local communities in some of the districts in this study. Past projects that attempted to change the dominant institutional arrangements in state dominated ownership regimes, for example ACM in Mafungautsi in Gokwe South, have not been very successful. However, they established a foundation upon which collective action can be further improved in communities surrounding protected forests. There is a need for more diversity in actors to enhance wide interactions among actors, hence improving those network attributes that favour emergence of new institutional arrangements and collective action.

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