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## **How can collective action and customary laws help to manage conflicts over natural resource commons in rural communities? Case study of Zambia**

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*Ambiguity in property rights underlies some customary practices such as bush fires and browsing by livestock which create conflicts in managing natural resource commons (natural fodder and bush animal meats) in eastern Zambia. To minimize risks of potentially explosive conflicts, among different socio-economic groups in the communities embarked on collective dialogues leading to the formulation of by-laws to guide privileges and responsibilities regarding the management of the above natural resources. In this paper, we (i) described the background of the problem and social conflicts associated with natural resource commons in Zambia; (ii) chronicled the process leading to the formulation, implementation and effectiveness of by-laws to manage the conflicts; (iii) conducted a sample survey of 196 households to assess the impacts of the by-laws on households and the different socio-economic groups in the communities. The study showed that collective dialogues and collaboration with traditional leaders can provide important entry points for interventions to minimize natural resources conflicts. Survey results of the impact of the by-laws revealed a remarkable reduction in the incidence of bush fire outbreaks (from 46% to 16%) and grazing that have led to conflicts in managing natural resources in the communities. It also showed that households who practice agroforestry and those headed by women were pleased with the by-laws; but livestock owners, boys and households who do not practice agroforestry perceive that they were disadvantaged by the by-laws. The following lessons were drawn from the study: (i) the distribution of the benefits (or costs) associated with a given natural resource among different interest groups influences the effectiveness of interventions to collectively manage the resource in rural communities; (ii) the possibility of inadvertent privatization of seasonal natural commons should be critically assessed as part of the efforts to minimize resource conflicts; (iii) the effectiveness of collective action on natural resources is closely linked to consensus-building among different stakeholders and willingness to review actions when and where necessary; (iv) an understanding of the dynamics of power structure among different interest groups in rural communities is critical to collectively manage natural resources and minimize conflicts.*

*Keywords: agroforestry, impact assessment, property rights, policy dialogue, technology adoption, village solidarity*

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### **1. INTRODUCTION**

One of the greatest fundamental biophysical impediments to agricultural growth in sub-Saharan Africa is low soil fertility which constrains efforts to improve crop productivity (Vanlauwe and Giller, 2006; Sanchez, 2002). The economic consequence of poor soil fertility on crop yield and its implications on food insecurity is particularly accentuated in southern African region where rain-fed agriculture is the primary source of food and livelihood for a majority of the population. Apart from the primary effects of declining per-capita food production and seasonal food shortages, poor soil fertility trigger other side effects such as lack of fodder for livestock production, high deforestation rates as farmers are forced to abandon poor soils and encroach on forests and river banks which are more fertile. The miombo woodland, which is one of the most extensive and important vegetation types in the Zambezi watershed, is at particular risk due to clearance for both agriculture and

charcoal production (Chidumayo, 1987). The total annual deforestation in some southern African countries is estimated at 55,000 ha for Malawi, 323,000 ha for Tanzania, 264,000 ha for Zambia and 50,000 ha for Zimbabwe (Geist, 1999). These figures represent annual deforestation rates of 1.6% for Malawi and 1% for Zambia and between 0.6 and 0.8% for Tanzania and Zimbabwe. The accelerating degradation of natural resources has the predictable consequence of creating potential social conflicts as the increasing human population scramble over dwindling natural resources. Soil fertility management has become a major issue of concern on the development policy agenda in African agriculture (Scoones and Toulmin, 1999).

Past efforts to solve declining soil fertility as a major cause of food insecurity in southern Africa focused primarily on promoting wide-scale use of subsidized mineral fertilizers. But in many countries in sub-Saharan Africa (SSA), the use of fertilizers by majority of smallholder farmers has been reduced because of high cost and difficult logistics of obtaining fertilizers (Kwesiga et al., 2003) especially after the removal of subsidies on fertilizers in the 1990s. As a case study, in Zambia, the ratio between the prices of nitrogen and the major crop (maize) increased four-fold after the elimination of price subsidies on nitrogen fertilizer and this led to a 70% decline in fertilizer use by smallholder farmers (Howard and Mungoma, 1996). Similar results of reduced fertilizer use following the removal of subsidies have been reported in other regions of Africa (Honlonkou, 2004). While the governments in the region have re-engaged in subsidizing and distributing fertilizer to certain categories of smallholders, such as the Farm Inputs Subsidy in Malawi (Denning et al., 2008), and Fertilizer Support Programme (FSP) in Zambia, more than half of smallholder farmers are still left out and application rates are largely sub-optimal. In addition, the fertilizer market is further constrained by the geographically landlocked nature of many countries in the region, and the poor road infrastructures which hinders access to agricultural inputs at affordable costs to smallholder farmers.

In response to these challenges, through a partnership between international and national institutions, extensive research and development activities were conducted to develop a number of sustainable soil fertility management practices that can help resource-poor farmers replenish their soils within a short period of time and reverse a negative trend that if left unchecked may put many rural poor at risk. These practices, called “fertilizer tree systems” allow farmers to produce Nitrogen nutrient on their farms, thereby substantially reducing the required amount of chemical fertilizers, which is often unaffordable to most smallholder farmers. Based on nutrient recycling principles, the trees replenish soil fertility by capturing atmospheric nitrogen in their biomass and making it available in the soil through decomposition for crop use. The technical details of fertilizer tree systems are described elsewhere (Kwesiga et al. 2003; Mafongoya et al. 2006; Akinnifesi et al., 2008). Fertilizer trees have been widely documented and known to double the yield of maize compared with continuous maize production without fertilizer, which is the de facto farmers’ practice (Sileshi et al., 2008a). Economic assessment of fertilizer tree systems shows that they are profitable compared with de facto farmers’ practice of continuous maize without fertilizer (Franzel et al., 2002; Ajayi et al., 2009). In addition to improving crop yield, the benefits of fertilizer tree systems to enhance soil physical properties, conserve natural resources (Ajayi et al., 2007), provide environmental services such as carbon storage (Sileshi et al., 2007; Kaonga 2009) and improve rural livelihood (Kwesiga et al, 2005; Schuller et al., 2006; Ajayi et al., 2007) have been well documented.

Given its performance and potentials for improving food security, efforts are being intensified to scale up fertilizer tree system to reach more smallholder farmers. While some successes in scaling up of the tree systems have been recorded, in some cases such efforts have been constrained by absence of well defined property rights which underlies some customary practices such as bush fires (rights over access to bush animal meats) and browsing by free-range livestock (rights over natural fodder) leading to social conflicts especially during the dry season. Farmers in Malawi, Zambia and Mozambique perceive uncontrolled fire and livestock damage as major constraints to tree planting (Sileshi et al.,

2008b). While the security of property rights over resources provides opportunities for improvement in economic wellbeing as it assures income for the present and the future but often, the rural poor have the weakest rights over resources.

Due to absence of private property rights over land, livestock usually graze freely on communal land and cultivated land after crop harvest. After grazing, the livestock usually deposit dung in the kraals of their respective owners rather than in the fields where they had grazed. In this situation, livestock owners gain as they have access to free fodder for their animals. With fertilizer becoming costlier and less available, farmers are adopting new soil fertility management techniques which involve planting nitrogen-fixing trees in their fields during the dry season. The failure of existing local institutions to address the interests of the different groups of farmers within the community creates a dilemma because poor farmers (and often the less powerful) are inadvertently made to subsidize relatively richer farmers who have livestock and who are more likely able to afford fertilizer. Free-ranging livestock destroy newly planted trees besides consuming maize cobs not yet harvested and crop residues. They destroy young trees by browsing the barks and leaves or physically trampling over them. For example, agroforestry development workers discontinued the use of pigeon pea (*Cajanus Cajan*) in eastern Zambia primarily because livestock browsed it extensively (Franzel et al., 2002). Although most farm households understood the importance of agroforestry to food security and the general wellbeing of the environment, 43% of farmers who did not plant agroforestry trees mentioned the threat of browsing, while 29% cited the risk of bush fires as important reasons for their decision (Kabwe, 2001).

The inability of existing institutional settings to address the interests of the different social groups within the community created a social dilemma. To correct the deficiencies highlighted above and protect the interests of the marginal group in the community in the management of the common resources, some collective actions were initiated resulting in by-laws. The pertinence of bylaws as a collective action mechanism for better management of natural resources has been aptly demonstrated in other regions of Africa (Alinon and Kalinganire, 2008).

In this paper, we (i) discuss the process through which collective action by rural households were organized and how it culminated in by-laws on fire and grazing to reduce these conflicts, (ii) synthesize information on implementation of the by-laws, the level of compliance with and effectiveness to address the problems highlighted and, the factors that influence the effectiveness of the by-laws, (iii) using a stratified sample of 200 male and female agroforestry users and non-users, we identify the type of effects that the by-laws have on household members and social interest groups within the communities to highlight those who have benefited from or disadvantaged by the implementation of the by-laws. The paper ends by drawing a number of important lessons from the case study to how collective action can be used as a mechanism to promote wider scaling up of natural resource management and manage social conflicts over natural resources in Zambia and other parts of Africa.

## **2. PROCESSES LEADING TO THE FORMULATION OF THE BY-LAWS IN ZAMBIA**

The by-laws came into being through social networks formed by poorer households who created social capital within the communities that allows them to work together to improve their bargaining power and overcome the limitations posed to their access to adopt natural resource technologies. It was a community response against seasonal social conflicts and continuous agitations by smallholder for a more equitable protection of individual rights and privileges in the management and access of common natural resources. The agitations at the grassroots in villages culminated in the establishment of informal social network of village action groups. These meetings later evolved into a more formal

and an expanded “Consultative Forum on Agroforestry” (CFA) in 1996. The Forum met on a number of occasions here it was agreed to expand to include other farmers groups and important stakeholders such as traditional chiefs, Ministry of Agriculture, research and development institutions working on rural development in eastern Zambia. The World Agroforestry Centre (ICRAF) became an active participant in the Forum. The Forum held a number of meetings to share information and organized field tours to witness the threats posed by customary practices of bush burning and uncontrolled grazing to the economic interests of some segments in the communities and to discuss on what should be done to reduce the threats to social peace and avert potential conflicts.

Recognizing the economic importance of these customary practices and their potential threats, the Forum discussed approaches through which the entire local communities could be involved to reduce the threats. Among many options (including some militants ones) that were initially considered, there was a consensus among Forum members to settle for more peaceful approach by engaging with traditional authorities (chiefs) to hone collective actions agreed about the fire and grazing practices under the traditional legitimacy of the chiefs. Traditional authorities are very much respected and they use their authority to put a stamp of approval on community decisions. They wield sufficient powers to enact by-laws and back up the same with appropriate sanctions thus ensuring social conformity among their subjects and, also act as custodians of conflict resolution in their respective domains through the traditional hierarchy of leadership<sup>1</sup>. But the communities owe cultural allegiance to different chiefs. Two major traditional authorities were identified as key entry points to accommodate the community decisions: (i) the matrilineal system presided by the paramount chief of the *Chewa* ethnic group and, (ii) communities operating patrilineal system presided by the paramount chief of the *Ngoni* ethnic group.<sup>2</sup> The two paramount chiefs and their senior chiefs accepted to back up the community’s collective agreement in the form of by-laws in their respective ethnic communities. The first by-law is on grazing and it makes it mandatory for livestock owners to herd their animals during the dry season to minimize damage to other farmers’ fields. The second by-law prohibits indiscriminate setting of bush on fire during the dry season to avoid accidental or deliberate burning of trees and maize stover in fellow farmers’ fields.<sup>3</sup>

In each of the two systems, the highest level of authority is the “Paramount Chief”. Below the Paramount Chief are “Senior Chiefs”, each of who is in charge of a group of chiefs. Next in rank to the chiefs are the “Headmen”, who are individually responsible for the welfare and administration of a single village. Paramount Chiefs, Senior Chiefs and Chiefs hold and preside over court sessions related to issues concerning traditions and cultural matters for the people residing within their respective domains. They are assisted by a council called “*Indunas*”, made up of selected representatives of the various communities under the jurisdiction of a chief. The *Indunas* serve as advisers and spokespersons of the chiefs in their respective communities. This local administrative setup was considered to be a good entry point for policy interventions regarding fire and uncontrolled grazing.

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<sup>1</sup> Although the absolute powers that traditional authorities in Zambia enjoyed in pre-colonial era has degraded due to demographic change, globalization and government policies in the pre-and post-independence era, they have retained sufficient cultural powers and respect to initiate sanctions in their respective domains.

<sup>2</sup> Although based in Zambia, the matrilineal paramount chief also has traditional jurisdiction over all the Chewas communities and their traditional institutions in Malawi and Mozambique.

<sup>3</sup> Historically, fire is used as a land management tool in Zambia, but there is a discord between official fire policies and actual indigenous fire practices (Erikson, 2007). The prevalence of fire has over time created a degree of fire dependency for the growth, production, regeneration and coexistence of miombo species (Van Wilgen and Scholes, 1997). Although, much controversy still surrounds discussions on fire utilization and the sustainability of indigenous land management practices, it is generally agreed that frequent uncontrolled fires are harmful both to vegetation and soil (Chidumayo, 2002; White, 1993) and biodiversity (Sileshi and Mafongoya, 2006).

### 3. IMPLEMENTATION AND EFFECTIVENESS OF THE BY-LAWS

Assessments of the by-laws were carried out through two surveys. In the first survey conducted in 2002, we collected information from 182 households in four agricultural districts to assess the level of implementation and effectiveness of the by-laws over time. The second survey was based on sample of 197 households drawn from the same agricultural districts was conducted much later in 2005 to identify the intended and non-intended impacts that the by-laws have on different members of the household and the various social interest groups in eastern Zambia. The four districts cover the patrilineal and matrilineal communities and represent 50% of all the districts in eastern Zambia.

The assessments showed that five years after the introduction of the by-laws, there is a remarkable improvement in the implementation of the by-laws and it led to a reduction in the two constraints of fire and grazing mentioned above. The by-law on grazing is much more effectively implemented than that against fire outbreak. An assessment of the by-laws by rural households reveals that only 16% of the respondents mentioned that the by-law on grazing was effective when it was introduced, but this proportion increased greatly as almost half (46%) of the respondents mentioned that the by-law has improved five years after it was introduced (Table 1). In the case of by-law on fire outbreak, the improvement in the effectiveness of the by-laws was assessed by the respondents to be marginal only. Five years after the by-laws were introduced, only one fifth of the households mentioned that the by-law on grazing was “not working” compared with almost half (44%) of the same households who had the similar assessment regarding the by-law on fire.

Table 1: Households’ assessment of the implementation and effectiveness of the by-laws in Zambia

Household assessment of by- laws	By-law on grazing (%)		By-law on fire (%)	
	Initial period	Five years after	Initial period	Five years after
Effective	16	46	13	14
Average	20	34	21	42
"Not working"	64	20	66	44
Total	100	100	100	100

The differences in the effectiveness of the by-law on grazing compared with that on fire outbreak may be attributed to several reasons. One of these is that it is easier to identify animals that strayed into another farmer’s field and to trace their owners for appropriate redress. In addition, the increasing cases of theft of animals have encouraged livestock owners to closely monitor their flock by herding them. On the other hand, the by-law is less adhered to because the probability of identifying and apprehending individuals who flouted the collective agreement on fire incidents is low as the fire may move quickly and much faster from the point where it was ignited to other locations. In few cases, fire incidents were linked to jealousy or acts of social leveling against specific target households rather than an “accident” (Ajayi and Kwesiga, 2003). The absence of forest officials (e.g. “fire rangers”) in contemporary government establishments also contributed to the recurrent cases of fire outbreaks and poor compliance with the by-law on fire. During colonial and post-independence periods, fire rangers were responsible for monitoring bush fire incidents and sensitize rural households about the danger of burning the bushes without authority and, to ensure conservation of natural forests and pasture lands. The by-laws are more effective during the rainy season when everyone expects livestock owners to keep their animals away from crop fields. However, as soon as some crops are harvested, the livestock are allowed to graze freely everywhere

except in dambo (wetlands) gardens where off-season farming takes place. Thus the property status of the fields oscillates between private resource in the wet season and common property resource in the dry season. The economic interests of individual households who plant trees became an important factor alongside the traditional land use patterns.

While the by-laws have made important contributions to solving the problems of fire and browsing in eastern Zambia, they have not completely solved the problems due to various reasons. The implementation and effectiveness of the by-laws in communities in Zambia is influenced by a number of factors:

*i. Power structure:* The type of power structure and economic interests among the different social groups within the rural community influenced the compliance and enforcement of the by-laws. In particular, in the implementation of the by-law on grazing, much emphasis was placed on protecting (or to not jeopardize) the economic interests of the more powerful livestock owners than on protecting the economic interests of the more populous but less powerful and less socially influential tree farmers who in most cases could not afford fertilizer. There were also cases of the fear to report cases of violations against the by-law on grazing as the owners of the animals are wealthier livestock farmers who also wield powerful social, religious and political influence in the communities.

*ii. Interpretation of individual rights under the collective agreement:* There is a lack of knowledge about the exact terms and provisions of the by-laws. While most of the households know about the existence of the by-laws, there is an indication that the exact provisions of the laws are less clearly defined because the by-laws are not formally documented. In particular, the level of compensation to a farmer whose field has been browsed by livestock is interpreted differently by the community depending on whether one is a livestock owner or a farmer. Some individuals mentioned that an aggrieved field owner is entitled to take one of the animals as compensation while others mentioned that the compensation has to be negotiated between the two parties. The interpretation is usually eventually done in the favor of the wealthier livestock farmers.

*iii. Implementation of the collective action:* The by-laws are based on moral persuasion and their implementation is effective only to the extent to which they are able to appeal to the good citizenship and sense of community responsibility by individual households.

*iv. Monitoring and enforcement of collective action:* The enforcement of the by-laws is in principle assigned to every member of the community but in reality, it was seen as the responsibility of nobody in particular.

*v. Cultural mutual support network and social hierarchy:* Due to the established relationships of hierarchy and, cultural norms of mutual social support in the communities, there were cases when strict enforcement of the by-laws is interpreted by some households as a form of “taking revenge” for a misdeed done by fellow villagers. In a typical rural setting where much emphasis is placed on social relationship and cohesiveness, there were hesitations in reporting cases of violations of the by-laws to the appropriate authorities. The hesitation becomes much more evident where wealthier households who own animals are the ones who failed to comply with the by-laws.

#### **4. IMPACTS OF THE BY-LAWS ON HOUSEHOLD MEMBERS AND COMMUNITY**

One of the lessons learnt from the interactions and policy dialogues conducted in the course of the implementation of the by-laws is that the two laws have created diverse impacts on different members of households and social groups with the communities. A field study was carried out in

2005 to understand the effects of the by-laws based on a sample of 197 households drawn from the different ethnic group, gender and tree planting practices represented in eastern Zambia (Table 2). The field survey provides insights into households' assessment and perception about the fairness of by-laws, including who is affected by the by-laws and how they are impacted by them.

Table 2: Composition of the households who assessed the impacts of the by-laws

Variable	Description	Number ( <i>n=196</i> )	Percentage %
Tree planting	Tree planting household	103	52
	Non-tree planting household	93	48
Total		196	100
Gender	Female	107	55
	Male	89	45
Total		196	100
Ethnic group	<i>Chewa</i> (Matrilineal)	125	64
	<i>Ngoni</i> (Patrilineal)	61	31
	Other ethnic groups	10	5
<b>Total</b>		<b>196</b>	<b>100</b>

The results show that the by-laws led to the planned beneficial changes including reduction of risk of fire outbreaks, free grazing and damage to trees, and reduced conflict between tree growers and livestock farmers. Some unplanned benefits were realized associated with the by-laws. These unplanned include reduction in cases of theft of livestock, reduction in the cases of burning of tobacco curing sheds and the consequential cost of rebuilding the same in the next farming season, increased availability of soil mulch and crop residues, and improved access to grasses for making tobacco barns (these grasses would otherwise have been burnt by fire outbreaks). The by-laws also led to improvements in social equity within the community as the by-laws were comparatively friendly to poorer households, especially women-headed households. Although it may not be the immediate concern of farmers, the by-law on fire has a beneficial effect on climate change because it reduces the potential emission of carbon into the atmosphere. Overall, about half (49%) of all the households mentioned that the by-laws are "fair to everyone". This group of households assessed that the by-laws are fair to all because they protect the interests of both farmers and livestock owners (58%); there were no cases of open complaints against the laws (38%), or because the by-laws inadvertently ensure the safety of animals and contribute to reduction in the theft of livestock.

However, while the by-laws produced the intended changes that benefit the entire community, there were cases where the implementation of the by-laws inadvertently resulted in negative impacts on specific individuals within the households and the community. The individuals who are mainly affected by these unintended negative impacts are children (boys), men and livestock owners in that order of importance (Table 3). Similar assessment of the effect of the by-laws was given by households who planted trees and those who did not. The non planned negative fallouts of the by-laws were much more felt by boys and men than women and girls because men and boys are the ones mostly engaged in hunting and shepherding of livestock within the households.

Table 3: Group of individuals who bear the brunt of the by-laws

Individuals against which by-laws are biased	Percentage of households who mention that the by-laws negatively affected the individuals		
	Tree planting households ( <i>n=103</i> )	Non- tree planting households ( <i>n=93</i> )	Overall ( <i>n=196</i> )
Men	19	16	17
Women	6	2	4
Children (boys)	48	39	43
Mice hunters	25	26	25
Livestock owners	41	49	45
Other individuals	31	30	31

As regards the by-law on fire, the most frequently mentioned downside effect is the reduction in the access to “free meat” in the households (Table 4). Deliberate setting the bush on fire is a common practice by individuals (usually young children) during the dry season as a method to hunt mice or “mbewa”, a very special traditional delicacy that is cherished by many people in eastern Zambia including very rich and educated persons in the towns. Individuals in the rural areas set the bush on fire as part of hunting during the dry season, to smoke mbewa out of where they might have sought refuge. Inability to set bush on fire adversely affects mice hunting and the availability of meat.

Table 4: Non intended effects of the by-law on fire on households and communities

Type of unintended negative impact of by-law on fire	Proportion of respondents (%) <sup>*</sup>
Reduced access to meat because mice hunting is affected	74
Inability to clear land on time in the next farming season	28
Inability to search and locate left over maize or “ <i>mashanga</i> ” in the field	21
Reduced access to sprouting fresh green grasses for livestock feed	8
The season becomes “dull” because of lack of entertainment during the dry season.	5

\* Note: total exceed 100 because some respondents provided multiple answers

Another non intended effect, according to the respondents interviewed, is that if the bush is not burnt, land preparation operation for the next farm year may take longer time to accomplish. In addition, some maize cobs which were inadvertently missed during harvesting operation may become more difficult to see and recovered if the field was not burnt. Other respondents mentioned that without bush burning and the excitement that goes with such, the dry season period may become “dull”.

Table 5: Non intended effects of the by-law on grazing on households and communities

<b>Unintended negative impacts of by-law on grazing</b>	<b>Proportion of respondents (%) *</b>
Access to fodder for animals become more difficult	32
Livestock farmers are restricted to just one activity during the dry season	19
More time is spent to take care of animals	9
Adversely affect boys' attendance in schools	7
The route taken for herding livestock becomes longer to avoid damaging trees in the field	4
Reduces fun and entertainment during the dry season	3

\* Note: some respondents provided multiple answers

As regards the by-law on grazing, the most frequently cited downside impact is shortage of fodder for livestock (Table 5). Some respondents mentioned that the by-law makes livestock owners to be tied down to just one activity (shepherding of animals) during the dry season and, so the season becomes “dull or less exciting.” Others mentioned that the route normally taken to herd animals inadvertently become longer as those who are responsible for shepherding the animals sometimes have to avoid passing through certain fields that have younger trees even though such route may have been shorter. Some respondents mentioned that the by-law adversely affect boys' attendance in schools as boys are usually tasked with the responsibility of shepherding livestock.

## 5. SUMMARY AND CONCLUSION

This paper provides an insight into collective efforts of poor households in rural Zambia to protect their economic interests and access natural resource management technologies that have the potential to make economic improvements in their livelihood. It elaborates on the background of the social conflicts arising over natural resource commons in Zambia and the *raison d'être* of the collective action culminating in by-laws on fire and grazing to reduce these conflicts. It also catalogues the processes leading to their formulation, their implementation and effectiveness, and positive and negative impacts of by-laws including intended and non intended impacts. A number of lessons are drawn and recommendations made for the use of collective action and customary laws as mechanisms for up-scaling natural resource management technologies and preventing social conflict over natural resource commons among rural communities in southern Africa in particular and other African countries in general.

First, in addition to ensuring social equity and fairness of collective action and local policy interventions, there is the need to pay attention to the local political economy and dynamics of power structure existing in the community. The implementation and potential impacts of by-laws may be compromised if more socially powerful interest groups within the rural communities perceive that certain by-laws do not directly serve their economic interests or are inimical to them. In enacting by-laws, careful attention need be paid to some issues, including questions on i) which group will be affected positively or otherwise by the by-laws? How will they be affected? ii) to what extent will they be affected? There is need for policy dialogues to build consensus among different stakeholders that are affected by the by-laws in the community by provide a conducive conditions for modifying the by-laws as at when and where necessary. A range of fodder tree species should be introduced as an integral part of agroforestry options so that the competition for feed by livestock during the dry season is reduced. These fodder trees will also ensure that the economic interests of livestock owners are well taken care of.

Second, the prevailing local policy and institutional arrangements affect the riskiness and potential adoptability of natural resource management technologies. The distribution of the benefits associated with a technology will vary amongst the various social groups within communities. Thus, a good natural resource management technology may not automatically lead to high field level adoption. Rather, in addition to improving the technological characteristics of natural resource management interventions, existing local institutional arrangements and nature of power structure in rural communities are important for their sustained and widespread up-scaling among rural communities. This is because rural households make decisions on natural resource management technologies based on a series of household level considerations and, these decisions are made within the framework of local policies and institutional arrangements. As Di Gregorio et al (2008) posit, economic growth or the existence of a natural resource management technology alone does not guarantee access to them and reduction of poverty if appropriate changes in social and economic processes are absent. Such changes would include raising the voice of the poor segments of the society and their participation in the (local) governance and processes of economic growth.

Third, appropriate existing traditional structure and institutions can serve as an entry point for policy intervention on natural resource management. However, the effectiveness of the interventions is linked to the readiness to build consensus as far as possible among different stakeholders within the community that is affected by the by-laws and willingness to review or modify them when necessary.

Fourth, due to social, economic and demographic dynamics in a community over time, cultural practices and norms are constantly changing. The change will either become opportunities or constraints to the different social groups within the community depending on how communities organize themselves in a collective action to protect the interests of the powerful and vulnerable groups within the community as it engages the new realities and dynamics of change. Policy research should become less prescriptive but increasingly oriented towards assessing the comparative merits of options depending on the institutional context and local conditions.

Fifth, as the conflicts related to natural resource management are becoming increasingly common and serious, it is necessary for the research and development community to become more involved in the search for institutional support for decision-makers at local levels to manage natural resource commons appropriately (Moore et al., 2000). Local populations need to take leadership in deciding appropriate land uses and ownership of resources as central governments are in most cases poorly placed to make decisions that are appropriate for local levels, especially in areas of agriculture and natural resource management.

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