# Management of Edible Stinkbugs (*Encosternum delegorguei*) in Bikita District, Zimbabwe

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## Abstract

*Forest products resources in most communal areas of developing countries are common property resources. Forests are important for the exploitation of timber and non-timber forest products such as industrial wood, fuel wood, grass, fibre, medicinal herbs and roots, harvesting of fauna associated with forests such as caterpillars, locusts, bees (honey) and animal habitats. The management of these forest resources at the community level appears to be done at best through communal system. Community-based natural resource management is a potential solution to the inter-related problems of poverty alleviation if it is based on sound management principles that incorporate transparency, efficiency, accountability and democracy. This paper explores the management of edible stinkbugs (*Encosternum delegorguei*) in the Jiri Forest of Bikita district in Zimbabwe. Research findings reveal that traditional institutional arrangements composed of chiefs, headmen, village heads and villagers that have been in place for a long time are coherent and have been able to withstand pressures on forest degradation.*

**Key words:** common property resources, traditional institutions, forest based livelihoods

## Sumário

*Os produtos dos recursos florestais na maioria das áreas rurais dos países em desenvolvimento são considerados como recursos ou propriedade comunais. As florestas são importantes para a exploração de produtos florestacomo madeira industrial, lenha, capim, fibras, ervas medicinais e raízes para além de recursos faunísticos associados com florestas tais como lagartas, gafanhotos, abelhas (mel) e os habitats dos animais. A gestão destes recursos florestais ao nível da comunidade é feita de uma forma correcta através de sistemas de gestão comunal. O manejo comunitário de recursos naturais é uma potencial solução para os problemas inter-relacionados de redução da pobreza se for baseada nos princípios de boa gestão que incorporam a transparência, eficiência, responsabilidade e democracia. Este artigo, explora a gestão de percevejos comestíveis na Floresta de Jiri, Distrito de Bikita no Zimbabué. Os resultados da pesquisa revelam que os arranjos institucionais tradicionais compostos por chefes de aldeia e os moradores que estiveram no local por um longo tempo são coerentes e têm sido capazes de suportar as pressões sobre a degradação da floresta.*

**Palavras chave:** recursos de propriedade comum, tradicional

## Introduction

More than 80% of the world's rural population directly depend on natural resources of land, water, forests, pastures, and fisheries for the supply of their basic necessities of life, for example, food, shelter, clothes and fuel. Products derived from forests for human survival and well-being are either timber or non-timber forest products (NTFPs). Non-timber forest products include (1) food, such as wild edible mushrooms, fruit and nuts; (2) medicinal plants and fungi; (3) floral greenery and horticultural stock; (4) fibre and dye plants, lichens, and fungi; (5) oils, resins, and other chemical extracts from plants, lichens, and fungi; (6) fuel wood; and (7) small-diameter wood used for poles, posts, and carvings; and (8) products of animal origin such as insects (Mapendembe, 2003). Some forest insect resources such bees and silkworms have been domesticated for honey and silk production respectively. However, drought and unsustainable harvesting of insects for subsistence and commercial purposes threaten the existence of insects or reduce their populations as renewable resources.

## Management of Common Property Resources

A common property resource (CPR) is a particular type of public good consisting of a natural or human-made resource system, the size or characteristics of which makes it costly, but not impossible, to exclude potential beneficiaries from obtaining benefits from its use. It is accessible to and jointly utilised by all members of the community, hence, community members have co-equal use rights (Singh, 1994). Thus, CPRs are a class of resources for which exclusion is difficult and costly, and joint use involves subtractability. They are thus basically 'open access' and freely available to any user (Tevera and Mukora, 2001). Examples of CPRs include irrigation systems, fishing grounds, pastures, and forests. These CPRs share three important characteristics: exclusion or control of access for free riders; each user is capable of subtracting resource units from stock available for the welfare of others; and there is a general lack of well-defined resource management units (Tevera and Mukora, 2001).

Analysing the design of long-enduring CPR institutions, Ostrom (1994) identifies eight design principles which are prerequisites for a stable CPR arrangement:

1. Clearly defined boundaries;
2. Congruence between appropriation and provision rules and local conditions;
3. Collective-choice arrangements allowing for the participation of most of the appropriators in the decision-making process;
4. Effective monitoring by monitors who are part of or accountable to the appropriators;
5. Graduated sanctions for appropriators who do not respect community rules;

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[1] For more information see www.who.int/iris/bitstream/10665/78256/1/9789241564564_eng and also, http://whqlibdoc.who.int/publications/2009/9789241563840_eng.pdf; www.who.int/violence_injury.../road_safety_status/2013/report/en/; www.who.int/violence_injury_prevention/road_safety_status/2013/en/

6. Conflict-resolution mechanisms which are cheap and easy to access;
7. Minimal recognition of rights to organise (e.g. by the government); and
8. In cases of larger CPRs: Organisation in the form of multiple layers of nested enterprises, with small, local CPRs at their bases.

Common property resources are generally vulnerable to collective action problems, thus they usually face destruction in the long run unless harvesting or use limits are devised and enforced. The resources are threatened by neglect, overexploitation, pollution, underinvestment, expropriation, general degradation, congestion and overuse because they are subtractable (Ostrom, 1994). A pasture, for instance, subject to excessive grazing, may become more prone to erosion and eventually yield less benefit to its users.

Effective natural resource management (NRM) combines economics, policy, and science to study, manage and restore natural resources and ecosystems. Various nations adopted the Convention on Biological Diversity (CBD) in 1992, aimed at the conservation of biological diversity, the sustainable use of biological resources, and the fair and equitable sharing of benefits arising from the use of genetic resources. However, one of the major challenges facing the Convention on Biological Diversity is the communication of research results in a way that provides the policy makers, their advisors, the scientific community and other stakeholders with helpful insights. Major factors leading to biodiversity loss are habitat loss and degradation, invasive alien species, overuse of resources and pollution. Due to the complexity of these factors, various approaches and strategies are being used to reduce biodiversity loss. However, the strategies require the best available scientific information that allows the development and implementation of sound management strategies.

The introduction and application of modern management systems of nationalisation and privatisation suitable for private ownership of resources, as experienced in most post-colonial Africa, has for decades ignored the time tested practices and management systems of their own people. There is not enough literature to show that the new institutions are contending with difficulties, although there have been notable successes. One success story in the management of CPRs is the communal areas management programme for indigenous resources (CAMPFIRE programme) in Zimbabwe, which is largely based on livestock. Various attempts at managing CPRs other than wildlife (for example, grazing schemes, local water resources and communal woodlots) have been largely unsuccessful (Cousins, 1992). The modern resource management systems have eroded and, in some cases, completely supplanted the traditional modes of resource exploitation. This imprudent application and imposition of the modern management systems in the utilisation of common property resources has invariably led to the inevitable degradation of the available resources. These systems lack a consensually agreed set of conventions, norms and guidelines (Singh, 1994).

Since the mid-twentieth century, there has been a growing consensus on the ecologically sustainable exploitation of natural resources to provide long- rather than short-term economic returns. Most developing countries have therefore ignored the modern management systems

because they view them as interference in their way of life. This has been pertinent in the management of common property resources, particularly in traditional or communal societies where these resources constitute an important factor in their livelihoods (Berkes, 1989). Past failures in sustainable resource utilisation have renewed interest in traditional management systems which are: community-based management systems that ensure livelihood security; common property systems to provide equitable use of resources with minimum conflict; and rituals to help synchronise harvesting with natural cycles, thereby leading to ecological sustainability.

The challenges of managing natural resources are manifested by institutional conflicts and the degradation of the resource base. If CPRs are managed carefully, they can be extended because the resource system forms a positive feedback loop, where the stock variable continually regenerates the fringe variable as long as the stock variable is not compromised, providing an optimum amount of consumption. However, wanton consumption leads to deterioration of the stock variable, thus disrupting the flow variable for good. Ostrom (1994) noticed that common property regimes or rights govern a number of CPRs. These are social arrangements regulating the preservation, maintenance, and consumption of CPRs. Such rules and laws govern the management of natural resources that are not owned by a single entity, person or family and access to which is limited to an identifiable community. Such arrangements are different from private property or goods (owned by private individuals or corporations) or state administrations because they are based on common local community self-management.

## Importance of Forest and their Products

Forests serve as animal habitats, they minimise land degradation, they are sources of timber and non-timber forest products such as food, fodder, medicines, gums, resins, fibres, construction materials, employment and income (particularly for rural poor, women and children). Availability of these forest products help to improve livelihoods and forest conservation (Myers, 1986, Fearndside, 1989, Falconer, 1996). Harvesting of wood and non-wood forest products such as fruit, vegetables, game, medicinal plants, fuel wood, resins and construction timber is leading to disappearance of global forests estimated at 15 x 106ha/yr, while Africa's net loss of forests and woodland is estimated at 6 x 106ha/yr (FAO, 2002). Sound management of forests and their products hold the potential of reversing forest destruction and biodiversity loss, and improving livelihoods in most societies (FAO, 1995).

Forest insects such as mopane worms, bees, caterpillars, locusts, termites and edible stinkbugs have environmental, socio-economic and cultural values in most southern African countries such as Botswana, Mozambique, Zimbabwe, Zambia and South Africa. Rural people, moving from a subsistence lifestyle to a cash economy, often get significant income from cash sales and barter exchange using forest resources. The shift from subsistence use to the commercial sale of insects has important implications for resource management as it results in larger volumes being harvested, a higher frequency and intensity of harvesting, and often affects resource tenure. Commercial harvesting and sale of forest insects is strengthening the resource tenure

and the incentive to conserve individual insect-bearing trees in some parts of Africa. However, unsustainable harvesting of forest products may lead to forest degradation and extinction of some species. The social and cultural values linked to forest insects are a reflection of the value placed on non-timber forest products. Insects are important sources of protein and add flavour to stews (FAO, 1995). They also provide traditional medicines.

## Edible Stinkbugs

### Characteristics

Edible stinkbugs (*Encosternum delegorguei*) are migratory green plant bugs belonging to the order *Hemiptera*, family *Tessaratomidae* or inflated stink bugs. They have piercing and sucking mouth parts, a shield body form, two pairs of wings, of which the hind wings are reduced, and they appear waxy green-yellow with a body length of 20-25mm. The nymphs are comparable to the adult but smaller and wingless (Tom and Thangwana, 2003).

### Geographical Distribution

The distribution of edible stinkbugs is due to environmental factors. They mainly occur in areas of high relief, shaded mountain slopes and high rainfall areas. Thus, the bugs have been observed in the Limpopo Province of South Africa, Mozambique and six highland districts of Zimbabwe (Makuku, 1993).

### Breeding Habits

Edible stinkbugs have an incomplete metamorphosis. The insect winters in the adult stage and never goes underground. Eggs are laid at the beginning of the spring season and development of nymphs occurs in summer. Full-grown edible stinkbugs are harvested in winter when there is little other food available (Tom and Thangwana, 2003).

### Nutritional Value of Edible Stinkbugs

Investigations into the medicinal and nutritional properties indicate a higher protein, vitamin, fat, amino acid, mineral, vitamin and mineral content than beef, milk or e.g. as well as anti-bacterial and anti-fungal properties (Mapendembe, 2004; Teffo *et al.*, 2007). After 15-30 days, the stored bugs lose taste but can stay in the refrigerator for more than five months. Edible stinkbugs are also processed to produce pesticides for vegetable aphids and ants.

Because of the socio-economic and environmental values of edible stinkbugs, it is important and indeed desirable to plan and introduce management systems that ensure sustainable exploitation of the resource. Harvesters are chopping down trees to access the insect. Therefore, there is a need for sustainable and efficient harvesting techniques. This paper presents results of study conducted to examine activities, practices and policies employed by the society for managing edible stinkbugs in the Bikita district of Zimbabwe. It intends to find out whether the model used by the society in managing edible stinkbugs is sustainable or not.

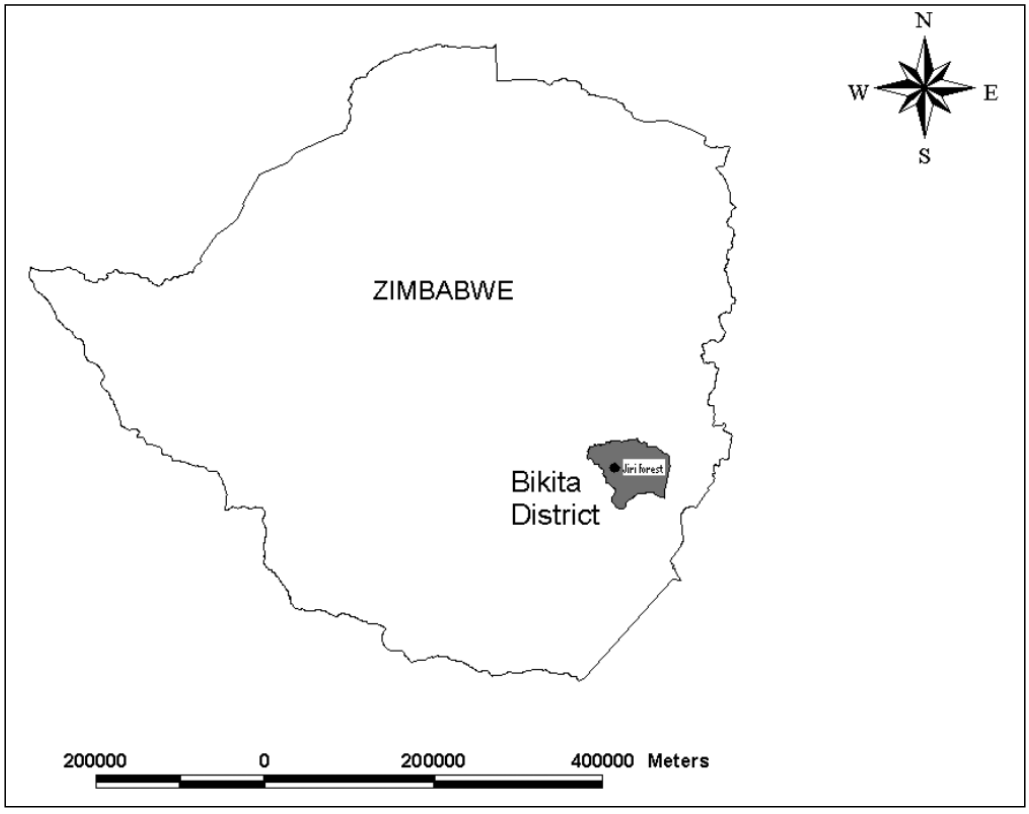


## Materials and Methods

### Study Area

The Jiri Forest is a community-designed protected area managed as a common property forest resource in the Bikita Highlands to the south of Zimbabwe. It is dominated by miombo woodlands comprising *Brachystegia* and *Julbernadia* species on mountain and hill slopes, *Teminadia Combretum* vegetation occurs in the valley slopes. The tree species are about 3m tall and are kept within this size due to continual severing and breaking during harvesting. Stocking density in the woodland is high, approximately 1 100 trees/ha due to strict monitoring and cutting not being allowed. Soils are mainly orthoferrallic, derived from deep weathering granite and leaching of bases under high rainfall regimes. The Jiri forest is divided into 17 sections for easy management and monitoring. Figure 1 shows the location of the Jiri Forest Bikita district in Zimbabwe.

**Figure 1. Location of the Jiri Forest in Zimbabwe**



The stinkbugs arrive in dense mass from the south usually toward the end of the rainy season and continue from April-September when they fly southwards with the approach of the rains (Mjele, 1934). They congregate in enormous numbers in the savannas or in Uapacca species in March/ April. The plant-eating adults aggregate during the winter and are easy pickings for harvesters early in the morning before the day's heat causes them to disperse. They feed on leaves of loquat trees. Host plants of stinkbugs include *Uapacca kirkiana, Brachystegia speciformis*, *Julbernadia globiflora* and *Pterocarpus rotundifolious*.

The Jiri forest is a managed common property resource. On average, 300 people enter the forest daily to harvest the stinkbugs, some from as far as South Africa. Stinkbugs are consumed as food for nutritional purposes (snacks or relish) and barter exchange (bartered for grain or other household needs). Some sell stinkbugs for cash to the local market, and exported to South Africa. The wastewater from the processing is used to kill aphids and ants in vegetable gardens.

## Harvesting of Edible Stinkbugs

The edible stinkbugs are harvested from March to September. Harvesters use traditional methods of hooked sticks to lower the branches on which the insects will be settling and ultimately pick and shake and/or beat the trees with stones to shake off the insects from the leaves. Such activities break the tree branches; tall trees are inflicted with scars as harvesters sometimes use stones to shake off big trees. No major changes in harvesting techniques have taken place in history.

## Data

### Participatory Rural Appraisal

Data was collected using structured questionnaires and interviews with key informants. A participatory rural appraisal (PRA) exercise was undertaken with the villagers during a meeting at the chief's homestead. A resource mapping exercise was done in which villagers drew the map of the Jiri Forest and its divisions on the ground. An institutional mapping was done to evaluate the functioning of local institutions (e.g. chiefs, headmen, village heads, and government institutions). This was achieved by ranking them in order of their relative importance in the management of the forest.

### Indepth Interviews with Key Informants

The aim of these interviews was to elicit information on management of the forest, problems and prospects. The interviewees included governments officials from the Environmental Management Agency (EMA) and Bikita Rural District Council (BRDC), local or traditional leaders (chiefs, headmen village heads) and youth groups (school children and young villagers). Data was recorded on an audiotape.

## Results and Discussion

### Institutional Structures Managing the Jiri Forest

Edible stinkbugs are a highly prized source of income in the Bikita district. Management of the

resource in the Jiri Forest stems from the traditional political structures of the area which are associated with the origins of the stinkbugs and therefore central to the management of the forest in which the insect is found. The Jiri Forest is managed continually during the pre-harvesting (January-February), harvesting (March-September) and post harvesting periods (October-December). Various institutions had been set to prevent the degradation of the resource base.

### The Village Heads

All 24 village heads in the area are equally involved and each distributes gifts (tributes) of the insect to other local chiefs, the district administrator, and the local police. The physical management of the forest is directly regulated by a team made up of a representative from each of the 24 villages in the area, with members rotating each year. Any person who seeks to pick the edible stinkbugs must report to the management team, although no one who reports to the team and follows the stated rules is excluded. Members of the team first allocate best lands exclusively to themselves in return for their efforts in managing the year's harvest. In this case, resource management institutions have been developed to reflect common interest rather than to protect more limited, vested interests. The tribute paid to the other surrounding chiefs and the fact that outsiders are allowed to collect edible stinkbugs means that they also appreciate the continued existence of the forest.

### The Forest Management Team

A team of 30 local guards drawn from each of the 30 villages on rotational basis is headed by an administrator designated as 'chief of edible stinkbugs' to manage the forest. The selection criteria ensure that each village is represented, although some villages may send more than one guard. The team keeps a record of the number of harvesters per day.

### Institutional Mapping

Table 1 highlights the roles of eight Jiri Forest management institutions and their importance as indicated by people in the area during rural appraisal session.

| Institution | Rank | Roles and Duties |
|---|---|---|
| Local traditional leadership (Chief/headmen/village heads) | 1 | Set rules that guide people on resource use, are owners of land, allocates land, resolves land disputes which make people live in harmony. Are owners of the Jiri Forest. They also set the wholesale price for the insect. |
| Spirit mediums | 1 | Help the chief/headmen/village heads on issues that need ancestral advice. |
| Villagers | 1 | Help the chief/headmen/village heads to make sure that rules concerning the Jiri and other woodlands in the area are adhered to. |
| Local guards | 2 | Help the chief/headmen/village heads make sure that rules concerning the Jiri Forest and other woodlands in the area are adhered to. |
| Forest Commission | 2 | Do not have much say in the Jiri Forest but works hand-in-hand with the chief on issues of sustainable utilisation of forests and their products. |
| Bikita Rural District Council (BRDC) | 4 | Unpopular with villagers because they are trying to introduce an edible stink bug levy.<br>Discourage cutting down trees and use of stones when harvesting the bugs.<br>Sometimes hold workshops encouraging villagers to conserve forest and sustainable methods to harvest edible stinkbugs. |
| Environmental Management Agency (EMA) | 4 | Do not have much say on the Jiri Forest but works with the chief on issues of sustainable utilisation of forests. Sometimes hold workshops encouraging villagers to conserve the forest and use sustainable methods to harvest stink bugs. Discourages tree cutting and use of stones when harvesting the bugs. |
| Villagers | 5 | Monitor trespassing into the forest and report to village head, headmen or chief. |
| Local councillors | 6 | Bring information on development issues, forward people's requirements concerning natural resources. |

### Camping Site

A campsite is established in the Jiri Forest where a team resides (before harvesting). Anyone who comes to harvest the insects first reports at the camp where instructions are given regarding the harvesting procedures, and the parts of the forest's 17 sections to be harvested on any particular day. The administrator and local guards stay in the forest before harvesting until the end of the edible stinkbug harvest season in September.

## Conclusions

Natural management systems in most African countries have been complicated by the articulation of different modes of production, following the subjugation of the indigenous mode and subsequent incorporation of the modern one. The communal ownership regimes that have emerged in most post-colonial African countries have certain characteristics that lead to over-exploitation of the

available resources. The resulting problems such as land degradation are thus regarded as inevitable outcomes of imprudent management of natural resources.

Community management of natural resources has become a highly managed system because it priorities community needs. This paper presents results of a study conducted to examine activities, practices and policies employed by the society for managing edible stinkbugs (*Encosternum delegorguei)* in Bikita district in Zimbabwe. Edible stinkbugs are an important source of income in Bikita District. Findings show that the traditional model used by the society in managing edible stinkbugs is sustainable. The traditional political structures of the area are said to be associated with the origins of the edible stinkbug and are therefore central in the management of the forest in which the insect is found. Leaders even set the wholesale price for the insect. All 24 village heads in the area are equally involved in managing the stinkbugs and they distribute gifts or tributes of the insect to their local chiefs, the district administrator, and the local police. Paying tribute to chiefs and allowing outsiders to collect the insect make them appreciate the continued existence of the forest.

The physical management of the forest is directly regulated by a team made up of a representative from each of the 24 villages in the area, with members rotating each year. Any person who seeks to pick the insect first reports to the management team, although no one who reports to the team and who follows the stated rules is excluded. Members of the team first allocate best lands exclusively to themselves in return for their efforts in managing the year's harvest. In this case, resource management institutions have been developed to reflect common interest rather than protect more limited, vested interests.

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