

**INDIGENOUS KNOWLEDGE: A NECESSARY ASSET IN THE CONSERVATION OF  
BIOLOGICAL RESOURCE IN TANZANIA**

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P.O. Box 1994  
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**Abstract**

*The paper discusses the role of indigenous knowledge (IK) in biological resource management. A comparison between traditional and modern biological resource management is also made. Examples of utilizing IK in research especially in inventory and medicine are discussed. Comparison of resource managed under indigenous regimes and those under modern practices is made to reveal the necessity of IK. IK dissemination, communication and transfer systems through generations is discussed to qualify its effectiveness in maintenance of proven sustainable practices. Indigenous communities' response to intervention is presented. Traditional utilization of biological resources is discussed relating it to IK. On-going biological resource degradation is viewed as partially related to lack of IK input in planning, management and utilization. Strategies for research, revival and application of IK are proposed.*

**Introduction**

The Convention on Biological Diversity (CBD) (which Tanzania will ratify soon) recognises the role of indigenous knowledge (IK) in the conservation of biodiversity and sustainable utilization of its components. It provides for the contracting parties to respect, preserve and maintain knowledge and innovations of indigenous communities (Article 8(f) of CBD). Also in the UNCED process, indigenous communities and IK were given high recognition, for their role in conservation of biodiversity and the environment (Chapter 15 and 26 of Agenda 21).

In general, people with the richest indigenous knowledge have least formal education (Cunningham, 1991). Thus, there is a tendency among the elite to treat them with contempt. However, indigenous knowledge makes the baseline for much of the modern science and technology. In areas like medicine, it caters for the majority of the rural poor who depend on medicinal plants and the urban rich through drugs developed based on IK. IK is very important but apparently not recognised nor rewarded equitably. When IK is lost it can not be recovered. Thus efforts must be done to preserve it.

The purpose of this paper is to establish the theoretical and practical essence of IK, qualify its role in development, identify dangers facing it and propose ways which can make it to be upheld in the process of conservation and sustainable utilization of biological resources in Tanzania.

### **Essence of Indigenous knowledge**

Indigenous communities have for ages developed and maintained traditional knowledge and practices for the management and conservation of biological resources on which they depend. Their knowledge and practices are empirical, based on continuous observation and their close attachment to natural resources. Their approach to management of the resources may be active or based on religious beliefs, taboo, folklore or myths (Kamara, 1993). In essence local or indigenous knowledge and practices differ from modern scientific knowledge (Warner, 1991). IK and associated practices allow for greater understanding of the heterogeneity (or “ecological particularism”) of local conditions as compared to scientific knowledge which may be developed into universal generalisation for a wider range of situations (Niamir, 1990; Warner, 1991). Since conservation of biological resources especially *in situ* conservation calls for knowledge of the local ecological conditions of the biological resources in question, then IK, is of paramount importance.

### **Nature of Indigenous Knowledge**

Indigenous knowledge is technical. Its technical attributes are embedded in its practical nature and capacity to produce sustainable environmental utilities. Warner (1991) adopted Bodley's (1976) definition of local technical knowledge, as that knowledge of the environment and procurement strategies based on intimate experience accumulated over many generations (Warner, *op.cit.*).

Many indigenous communities all over the world have been qualified for their keen indigenous knowledge and management practices they have been applying in biological resource conservation (Lusigi, 1982; Johannes, 1982; Wastern, 1982; Bell, 1984; Martin, 1984; Baldus, 1987; Niamir, 1990; Warner, 1991). IK is also well known for its important role in agricultural production (Sands, 1986; Warner, 1991) and animal husbandry (Lane, 1990; Niamir, 1990). Thus, IK and associate practices should be at the core in the process of conserving biological resources.

### **Application of Indigenous Knowledge in Tanzania**

In Ngorongoro Conservation Area where some IK has been incorporated in the management of biological resources, there has been considerable success. According to Fosbrooke (1990) "...occupied by about 120,000 cattle (plus a considerable human population: resident, tourists and wildlife) no devastation has occurred such as is apparent in adjacent regions. This according to Fosbrooke, (1990) is due to the skill of Maasai as pastoralists, in contrast to the lack of technique in their neighbour to master such skills as agropastoralists would have to maintain a stable environment. Ghai (1990) sees the Barabaig practice as a complex and highly developed system of resource management suitable for the semi-arid condition of the Hanang plains (where the Barabaig live) before they were disturbed by wheat farming. Through intimate knowledge of their environment and through intricate mechanisms governing the use of grazing lands, which are held as common property by the community, the Barabaig have historically maintained the productivity of their land (Ghai, *op.cit.*).

The Barabaig apply rotational grazing method to manage their pasture (Lane, 1990). On the other hand, the neighbouring Hadzaabe who dwell the Yaeda Plains, have a clear and systematic cycle of utilizing their range for hunting and gathering. They do not destroy the range or animals. They never starve even during harsh dry season (Izumbe, personal communication.). This is very similar to the Desana of Brazil who have a calendar for fishing and gathering (Warner, 1991). Both the Hadzaabe and Desana have knowledge and practices that they apply in the sustenance of the resources on which they depend.

### **Indigenous Knowledge in Utilization of Biological Resources**

Scientists and extension workers need to appreciate that traditional use of biological resources is an important aspect of the process of conservation and sustainable utilization of biological resources. Bell (1984) defines traditional use as the use by rural people of wild plants and animals, using methods that do not involve advanced technology or extensive commerce (Bell *op.cit.*). The indigenous communities have survived on these uses for many generations. Such uses can be considered more or less sustainable. Abolishing such uses which motivate the indigenous communities to manage the resources would devastate both the communities and the relevant biological resources.

### **Scope of Indigenous Knowledge**

In Tanzania and many developing countries where indigenous communities exist, as earlier observed, IK is necessary for facilitating indigenous communities' success in utilizing biological resources. Success here refers to sustainable utilization of the resources. The IK enables them, especially women, to deliberately regulate their harvest practices and perform other activities that ensure 'continued' (sustainable) utilization of the resources they manage.

Through utilizing animal and plant resources for example, indigenous communities

learn names of the animals and plants, their behaviour patterns, and ecological factors under which they flourish. They thus would know the phenology of a given plant, its favourable edaphic and topographical conditions that influence its distribution/location. For medicinal or food plants they would know alkaloid properties and when best to exploit the plants for best yields (Kamara, 1994). A study conducted in Uganda at Mukono area (among agriculturalists) and around lakes Katchera and Mburo (among pastoralists) revealed that local classification system of vegetation (including wetland) types conform favourably to those used by formally trained ecologists/botanists (Cunningham, 1994). Also Cunningham observed at Lake Katwe in Uganda, that women would come from very far to collect certain medicinal herbs at the lake, as they are considered more effective from that site than the ones at other localities. Similarly they would collect the long (90-130 cm) culm of *Cyperus leavigatus* (from the site) to be used for mat-making.

Local communities keep inventory of species and keep record of those which disappear or are recruited in their area (Kamara, 1994). To do that, they assign a name to new plants and animals. Their naming system has been described by Anacleit *et al* (1976). In this system the name reflects the biology/ecology and valuable attributes (medicinal/socio-economic/socio-cultural or poisonous) of a species. When compared to Kiswahili, indigenous naming is more precise (Swaynnerton, 1946; Haldane, 1946).

In a similar way, IK is applied to agricultural biodiversity and indigenous biotechnology. Traditional crop varieties development, maintenance and application of indigenous biotechnology in brewing and fermentation are some of the common examples of IK used in this regard.

Indigenous knowledge extends to other areas including climatology and weather forecast, soil classification and watershed management. An ongoing study in Mukono district Uganda has already detailed on the local naming of seasons and months that reflect climate. Also indigenous soil classification and watershed description and management are covered in this study (Tamale, 1993). In this study the naming system described, reveals its relevance to use and ecology.

### **Some Threats to Indigenous Knowledge**

With cultural and environmental change, both biodiversity and customary knowledge are being lost at rapid rate (Cunnigham, 1991). Recent evidence has shown that both coastal people and subsistence agriculturalists often use livelihood strategies which influence the level of biodiversity in their habitat in order to maximise options and reduce risk. These systems and their knowledge and values, are constantly under pressure to adapt to the modern economic ethos of emphasizing the generation of profits, an adaptation made at the cost of severe loss of both cultural and biological diversity (Voss, 1993).

Through the introduction of foreign culture by way of religious practices and the "modern school", certain traditional religious or rituals that were relevant or involved in resource management in a traditional way are lost (Kamara, 1993). Also through modern schooling and programmes, the school going groups miss attending to traditional resource management practices (Griffith, 1936; Niamir, 1990). The impact of such losses in cultural practices befall on biological resources (Kamara, 1993).

von Oppen (1991) identified several indigenous approaches in resource management in Tanzania. These include active management and those based on traditional religious beliefs and myths. All in all, the approaches contribute towards protection of the biological resources, important for the survival of the indigenous communities and biological diversity in their areas. Most tribal cultures set up demarcation lines to control biological resources (Martin, 1984). If undisturbed, indigenous communities form certain rules or norms that everyone in the community has to abide by. Practices necessary for keeping the rules and norms are passed on from generation to generation through various social and cultural institutions. However, in Tanzania, political decisions on settlement patterns, land tenure policy and establishment of protected area systems, threaten the existence of both indigenous communities and IK thereof and the environment.

The 1974 Ujamaa villages programme displaced most local and indigenous communities. As a result many of their religious areas protected for traditional use, were devastated through "non-traditional users" getting access to such areas (Niamir, 1990). In a few places where traditional areas/property survived or were not touched by Ujamaa Villages, indigenous tenure and IK knowledge still work.

Nationalization of land has been perhaps the single most damaging factor to traditional social control on natural resources (biological resources). It eliminates any local responsibility for the maintenance of the resource. Nationalization of land and abrogation of tribal territorial rights, also contribute to both socio-political fragmentation and marginalization and increase claims by non-traditional users (Niamir, 1990). The non-traditional users could be Government or private/public institution; whose the effect on indigenous communities and their practices and the biological resources is enormous. The establishment of a wheat farm in "Barabaigland" for example, is already threatening the area with degradation (Lane, 1990), since the practices imposed on the land are not sustainable. Likewise the life style of the Hadzaabe and much of the natural resources in Yaeda plains are threatened with extinction from development of parks and reserves, settlements and commercial (especially hunting) utilization, in the Hadzaabe's traditional area.

The case of Maasai land alienation is historical and documented (Arhem, 1986; Collet, 1987; Lindsay, 1987; Prins, 1992). Large tracts of Maasailand were taken over by settlers and indigenous farmers and traditional pastures turned into beef ranches and wheat schemes and small holder farms (Arhem, 1986). This is in addition to Game Reserves, National Parks, Forest Reserves and Ngorongoro Conservation Area. Most, if not all, of these establishments have excluded the Maasai from their traditional resource areas, interfered with their resource management systems, disrupted their socio-cultural system and marginalized most of them. The effect of these developments has been twofold. first is degradation of some areas taken from the Maasai due to practices by non-traditional users. Second, the displaced Maasai are either pushed to marginal/fragile lands where they inevitably cause degradation or to new habitats where they cannot "faithfully" exercise their indigenous/traditional

knowledge and practices, thus end up in degrading these areas and conflicting with indigenous inhabitants of the new areas.

### **The role of indigenous knowledge in development**

The contribution that indigenous people have made to western agriculture, medicine and the art have yet to be recognised, much less protected and paid for because their knowledge is not valued or compensated. Over many generations, indigenous communities have evolved a holistic, scientific knowledge of their land, natural resources and environment. Development of science and technology have greatly relied on this knowledge, to reach the present status. Ethnobiologists and ethnomedical researchers for example, have been for many decades recording animals, plants, medicinal plants and their properties and indigenous prescription practices. In this paper, two aspects of IK application are discussed: (i) use of IK in animal/plant resources inventory/surveys and (ii) IK in medicinal/drug research.

### **Indigenous Knowledge in Animal/plant Resource Inventory and survey**

Most of the scientists (botanists and zoologists) carrying out inventory or collection of animals/plants, rely heavily on the guidance of local people to access such animals or plants. Often information on the biology or ecology of a specimen is also supplied by the local people through interviews or on-the-site demonstration. For example, the works of Haldare (1946) and Swynnerton (1946) acknowledges the role played by indigenous people and their knowledge. Most of the scheduled animals and plants under the fisheries, forestry and wildlife legislation were derived from such works. Swynnerton's mammals list in English, scientific and vernacular names shows a pattern where the more traditional/indigenous a tribe is (e.g. Sandawe, Taturu and Nyinsanzu) the fuller and precise the list is under its vernacular. Under Kiswahili for example, all species of rats, mice and gerbils are recognised by one name "panya". In the other indigenous languages, species/sub-species are assigned separate names.



Many lists of animals and plants which have been made were based on vernaculars and IK. These include:

- A Dictionary of Native Plant Names in the Bondei, Sambia and Zigua... (Sangai, 1963).
- Mimea ya Eneo la Mashariki ya Pori la Selous (Rodgers and Ludanga, 1973).
- Orodha ya Miti na Migomba Mkoani Kagera (Kanywa, 1986).
- Information on Indigenous Drugs of the Coastal Regions, Tanzania (Kabudi, 1990).
- List of Vernacular Names of Wild Animals of Selous Game Reserve ... (Stronach *et al* 1994).

Such lists are handy in the field, especially when using local assistants who have no formal training in scientific or English naming.

### **Indigenous Knowledge in Medicinal Plant Research**

Between 70-80% of the population in Africa rely on traditional healers for their treatment using medicinal herbs (Koita, 1991; Ruffo, 1991; Vongo, 1991). Until the beginning of the 19th century, all medicines were traditional (Koita, 1991). Medicinal plants and their products have been used in the treatment of many tropical diseases including Malaria.

74% of chemical compounds used as drugs today have the same or related use in western medicine as they do in traditional medicine system (Elisabetsky, 1991). It has been estimated that ethnobotanical information might have increased the yield of active plants by 50-100% in the National Cancer Institute (NCI - U.S) research programme in the search for anti-cancer and anti-AIDS drugs (Elisabetsky, 1991). 25% of US prescription drugs contain one or more plant-derived active ingredients (Elisabetsky, 1991). So far, only a small proportion of the higher plants has been

screened for their biological activities. It is estimated that only 1-2% of the flowering plants (some 250,000 species) have been screened for the presence of alkaloid (Elisabetsky, 1991). Therefore the potential for further discoveries is still high.

Research/production cycle for a drug is estimated at 20 years (Elisabetsky, 1991). When a drug is developed based on ethnopharmacology this time is often reduced considerably. Elisabetsky considers the reduction in time to be facilitated through:

- (easy) plant selection
- "leads" from traditional use that allow for narrowing the pharmacological study
- "leads" from traditional models of preparation that provide clues to active compounds
- lower laboratory investment.

Thus works like that of Kabudi (1990), where information derived from IK on medicinal plants including preparation of the alkaloids, become invaluable.

Where indigenous people are willing, a lot of useful information on medicinal plants can be obtained. For example, in the survey conducted in Tabora (Ruffo, 1991) (based on an interview with 27 traditional healers, from 30 villages in 25 wards, covering about 15% of the region) yielded 127 medicinal plants in 45 families and 95 genera, that can cure up to 66 different human diseases. Through processes like this, the world has acquired large volumes of medicinal plants in medical research/drug production and trade. In 1985, the world market value of drugs was estimated at US \$ 90 billion; medicinal plants accounting for \$ 43 billion. In 1980 the imports of medicinal plants worldwide were estimated at US \$ 551 million (Elisabetsky, 1991). Behind this background, IK upon which the volume of medicinal plants and the trade is based, is generally free, treated with contempt and little or no reward is accorded to it! How long will this continue before the world overspends this kindness? What strategies are there, especially in Tanzania, to ensure that indigenous communities can effectively cooperate with scientists in this regard?

## **Proposals**

1. People (the indigenous producers) are no longer seen as a resource and a basis for development, but as obstacle to development (Arhem, 1986). This is more obvious in establishment of parks, reserves and large-scale agricultural development. In the planning and execution of such projects, local communities should be involved, if possible from the beginning. All such plans should have alternatives for the affected indigenous/local communities.
2. If a company accumulates useful knowledge it patents its products and makes profit from its use. IK has been made public without any patent rights. Sometimes it is used without even acknowledgement. In the framework of the Convention on Biological Diversity (Articles 8(f) and 11) Tanzania should find a suitable mechanism of rewarding indigenous people who contribute profoundly towards conservation and sustainable utilization of biological resources. Scientists should be able to make joint publications with their indigenous counterparts. They should also ensure publicity of work done or "discovery" made through the indigenous people experts. IK will be given value also, if it is regarded as a true expertise.
3. In dealing with degraded areas it is important to bear in mind that local or indigenous communities in a degraded area, have knowledge of the processes and events that led to the stage and state of degradation (Kamara, 1993). Hence, scientists and extension workers should avoid being intellectually pejorative towards the local people's IK and their associated practices. This is a pre-requisite for both introducing new ideas or solving existing problems. In this regard, the government should be advised to reinstate the social role of indigenous cultures - these may run parallel with established government institutions. In the same way, true and non-political cultural programmes should be re-introduced in schools.

4. Where government-negotiated local-level community organisations for natural resources management, e.g. Selous Conservation Programme (Kamara, 1994) do exist, cultural and social utilization of natural resources should be encouraged. Where possible they should be given equal weight as are commercial or those based on economic benefits. This is likely to encourage the indigenous communities to re-apply indigenous resource management practices. The government should be advised also to accord the same treatment to grassroot initiative organisations such as Korongoro Integrated Peoples Oriented to Conservation (KIPOC).
5. An association to link interested scientist, indigenous peoples' experts and other interested people in the public should be formed to create a forum for them.

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