Indigenous Technical Knowledge as Reflected in the Management of Natural Resources in Tanzania

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1 INTRODUCTION

In the broad sense, natural resource management can be defined as taking a firm decision about future of any area of resources, applying it and monitoring the application (Rietbergen 1993). It is widely accepted that natural resources should be managed to meet the social, economic, ecological, cultural and spiritual needs of present and future generations. Much of these benefits should be geared towards the local communities. Local communities surrounding natural resources, who should be the first hand beneficiaries, know the resource better than outsiders and have therefore a great role to play in resources management.

Within natural resource management systems, Indigenous Technical Knowledge (ITK) embraces people's knowledge of tools and techniques for the assessment, acquisition, transformation, and utilisation of resources which are specific to the particular location. ITK can encompass:

- Vernacular: Technical knowledge held by all or most individuals in a specific locality e.g. knowledge of crop rotation, pests and weed control;
- Specialised: The technical knowledge of certain skilled "resource persons." e.g. medicine, charcoal making, blacksmithery and varietal testing;
- Controlled: Knowledge held by dominant groups in the society such as a specialised knowledge held by dominant groups in the society such as a specialised knowledge referred to above, or skills in animal breeding, hunting or water diving;
- Social: Knowledge belonging to a group (clan or tribe) or community e.g. grazing rights, fishing control and tenure regulations.

The categories often overlap but in all cases ITK is the main resource which is controlled at least by parts of the rural people (Kajembe, 1994), whilst, natural resources and labour had normally been appropriated by outside powers. Even under those schools of thought that neglects the role of ITK, interventions in natural resource ecosystems that benefit some people may harm others. And as such, natural resources management has not only involved expert operations, but also political negotiations and social considerations in order to reconcile divergent interests. The responsibility should be to establish natural resource management regimes that yield optimal results to the society as a whole while respecting individual resource use rights and duties as much as possible. Some innovative management approaches have therefore to emerge from both sides of the management partners i.e. local people and professionals.

2 PERSPECTIVES ON HOW LOCAL KNOWLEDGE CAN BE UTILLIZED FOR SUSTAINABLE NATURAL RESOURCE MANAGEMENT

There are three Indigenous Technical Knowledge perspectives, namely: The Instrumental perceptive; The Interpretative or Farmers-First perspective; and The Actor-oriented or Beyond Farmer-First Perspective.

2.1 The Instrumental Perspective

The Instrumental perspective is mainly based on ecological or technical point of views, in which the use of indigenous knowledge can be seen as contributing to a better assessment, management and conservation of natural resources and to forming a basis for new (ecological) scientific knowledge (Inglis, 1993). This perspective is called "instrumental" because the knowledge and skills of local people

are used as an instrument in externally designed and top-down implemented development or conservation projects. In many transfer of technology mode of projects in Tanzania for example, local people participate only in the implementation activities, not in decision making and evaluation activities.

In this perspective, indigenous or traditional knowledge is viewed as a static body or stock of skills and experiences resulting from a long tradition of direct interaction between local people and their natural environment, from which useful information can be "harvested" by outsiders.

2.2 Interpretative or "Farmer First" Perspective

As a reaction to the instrumental perspective, the interpretative approach perspective emerged, mainly advocated by Chambers, et al., (1989). This perspective is based on previous farming systems analysis of the complex, diverse and risk-prone situation in resource-poor agriculture and on the recognition of the importance of local knowledge in these farming systems. This perspective calls for a reversal in the relation between farmers and external (scientific) experts. It is argued that it is the farmers who should formulate research agendas and experiment and innovate, based on their own specific situation, and external experts should act just as facilitators.

This reversal of power places farmers' knowledge at the centre. Farmers' knowledge, problems, analysis and priorities should be the starting point of any development efforts. Many case studies show the capacity of farmers to experiment and innovate (see for example Richards, 1985 and Kajembe, 1994.) This capacity is comparable to scientific experimentation and innovating. Any integration of (western) science and local knowledge should be based on this assumption. The role of the external actor (scientist and extensionist) is not to impose solutions from the laboratory in a top-down model, but to facilitate local initiatives by offering a "basket" of choices (like new varieties, technologies etc) from which the farmer can choose the most appropriate in his/her particular situation. Richards (1985) states that "intellectuals, development agencies and governments have all pursued environmental management problems at too high a level of abstraction and generalization". Many environmental problems are, infant, localised and specific, and require local, ecological particular responses.

From this perspective it follows that research should not be directed on further sophistication of scientific knowledge and on the transfer of this knowledge to the ground as in a "Transfer of Technology" model, but on a better understanding of indigenous management systems and technology. Then, from this understanding, research can seek for ways to build upon and strengthen local initiatives. Put simply, the role of external animator will be to find out what people are doing and help them to do it better.

2.3 An Actor-Oriented or Beyond "Farmer First" Perspective

The third perspective moves beyond the Farmer First perspective, not only by rejecting its basic goals, namely: active participation of all actors, empowerment of the local people and poverty relief, but by deepening the concepts of knowledge and power in the analysis of natural resources management and by adopting a more actor-oriented approach. An actor-oriented approach allows for the recognition of development history (Kajembe,1994). From an actor-oriented perspective, institutionalisation only become real when introduced and translated by specific actors (including here not only the farmers but also others such as scientists, extensionists and politicians).

This implies that these "basic" trends do not eliminate power within the local situation, nor do they eliminate an active role for the farmers involved. What they do result in is a shift in the basis of power relations, and also a shift in various definitions of farmers' role. At the same time, increasing institutionalisation often results in the emergence of new structural discontinuities and hence in the creation of new points of leverage and space of manoeuvre which may become crucial in the interaction with various intervening agencies (Kajembe, 1994).

The actor-oriented perspective criticises the populist "Farmer First" perspective for its simplistic assumption of the need for a power reversal. Comparable to the advocates of a transfer of technology, "Farmer First" suggests a transfer of power from external experts to local people. This still suggests a

pattern of powerless insiders, and neglects the complex and dynamic process of knowledge categorisation and generation.

The "Actor-oriented" or "Beyond Farmer First" perspective argues that both scientific and indigenous knowledge are fragmentary, partial and temporal. Knowledge is constantly being generated and constructed as a product of the dynamic process of interaction between various actors, each with different cultural backgrounds and understandings. In this, the advocates of "Beyond Farmer First" or "Actor-Oriented" perspective recognise the fact that multiple actors do exist in natural resource management and rural development at large. Knowledge is not just a commodity which can be transferred form one actor to another, but the outcome of a process which is result of negotiation on the "interface" between these multiple actors (Long and Villareal, 1994)

In this framework, local actors (individuals or groups) should be seen as "situated agents". Within the limits of existing information, uncertainty and other constraints (e.g. physical, normative and politico-economic), local actors are knowledgeable and capable (Chambers et al., 1989). They attempt to solve problems, learn how to intervene in the flow of social events around them and monitor continuously their own contingent circumstances.

Giddens (1987) points out that "agency" refers not to the intentions people have in doing things – social life is full of different kinds of unintended consequences with varying ramifications – but, to their capability of doing those things in the first place. Action depends upon the capability of the individual to "make difference" to pre-existing state of affairs (Kajembe, 1994). As a matter of fact, all actors exercise some kind of "power" even those in highly subordinated positions. As Giddens (1987) puts it, "all forms of dependence offer some resources whereby those who are subordinated can influence the activities of the superiors." And in this way they actively engage in the construction of their own social situation although the circumstances they encounter are not merely of their own choosing.

Considering the relation between social actor and structure, Giddens (1987) argues persuasively that the constitution of social structures, which has both a constraining and enabling effect on social behaviour, cannot be comprehended without allowing for human agency. He writes "In following the routines of my day-to day life, I help to reproduce social institutions that I played no part in bringing into being". They are more than merely the environment of my actions since they enter constitutively into what I do as an agent. Similarly, my actions constitute and reconstitute the institutional conditions of actions of others, just as their actions do to mine. My activities are thus embedded within, are constitutive elements of structured properties of institutions stretching well beyond myself in time and space (Giddens, 1987:11).

Human agency, or the capacity to devise ways of coping with life, plays a role in the way actors create new possibilities for development by influencing others, or in other words, create room for manoeuvre.

3 RECORDING OF ITK IN TANZANIA

Besides of all the evidence available, most professional Natural Resource Managers are still sceptical about farmers knowledge and experimentation, partly because farmers seldom record their accomplishments in writing, rarely write papers in their discoveries and do not attach their names and patents to their inventions. As a result, in most cases the history of natural resources development is written without reference to main innovators who are the farmers (Kajembe and Wiersum, 1998). However, in British Tanganyika, there was a tradition dating from 1930s that colonial district officers collected information as part of indirect rule (McCall, 1996). Much of this information was used to record customary patterns of land tenure and crop and livestock ownership.

In 1980, contemporary interest was revived first by Brokensha's work. Initially the work started in Kakamege, Kenya under the Forestry, Tree and People Programme (FTPP). Later, the work was continued in Singida, Tanzania under the funding of the International Centre for Research in Agroforestry (ICRAF) (McCall, 1996). The work by Kajembe in 1994 carried out in Dodoma Urban and Lushoto District, Tanzania showed that local people knowledge and skills can be effective means to

increase extension agents sensitivity to local needs, and stimulate meaningful dialogue between all actors in community based forestry management.

According to FAO (1993), natural resource management has been much more concerned with conserving the resource without local communities. Protection of natural resources has at times seen as necessitating disruption of the traditional ways of life of local communities. An effort has therefore to be done to incorporate social values into natural resource management systems and this incorporation has to be effective. It is through this incorporation where ITK has a chance to be recognised and valued.

Work done by Edje and Semoka (1990) on traditional systems of soil fertility maintenance with special reference to bean production concluded that traditional forms of soil fertility maintenance will contribute to the present interest by involving both natural and social scientists in the documentation and adaptation of indigenous bodies of unwritten knowledge for enhancing soil fertility and productivity. Kihwele, (1994) stated that over 99% of Tanzanian beekeeping Industry (Apiculture) is carried out by forest-based small-scale beekeepers who use indigenous technical knowledge to harness the stinging honey bees. He further emphasised that local beekeepers have a lot of knowledge in keeping, which is being transferred locally from one generation to another.

Furthermore Makali (1998) in the study carried out in Dodoma rural concluded that "customs, and traditions which in some ways help to conserve forests and which are effective tend to suit the conservation purpose at low cost". However, most of these local institutions seem to have taken a decreasing trend with regard to their authority in forest management activities due to some prevailing socio-economic factors.

4 DYNAMICS OF INDIGENOUS KNOWLEDGE SYSTEMS

In adapting to changes in their environments, local people in the tropics not only vary products that they use, but also the practices they employ, the amount of labour they expend, as well as other socio-economic factors. The sources of the change that affect them are not invariably "outside" pressures or influences alone, but also changes engendered by the local people's own subsistence activities and experimentation. It is undoubtedly true that many important changes have resulted from the impact of outside forces, and that increasingly the independent decision making of local people has been undermined. However, we believe it is theoretically unsatisfactory to base one's analysis entirely on the notion of external determinism.

Perhaps the least recognised aspect of ITK is its experimental nature. In fact the use of the word "Indigenous knowledge" itself may create an impression of knowledge that is static, after it has proved to be useful through countless generations. However, in reality this knowledge is constantly evolving and being updated with new information. Rhodes and Bebbington (1988) identified three kinds of local people's experiments: curiosity, problem solving and adaptation experiments.

- *Curiosity experiments:* with regards to curiosity experiments they gave an example of a Peruvian Farmer who simply out of curiosity did an experiment to test whether epical dominance would affect the number and size of potato tubers.
- *Problem solving experiments:* farmers usually carry out experiments to solve their problems. Kajembe and Kessy (1999) in the study carried out in Mwanza and Tabora Regions found that farmers are experimenting with a number of techniques to solve the problem of termite attack to young tree seedlings.
- *Adaptation experiments:* In adaptation experiments, farmers can either test unknown technology in a known environment or test known technology in a new environment.

Studying experiments as undertaken by rural people give understanding of their "sense making" activities (Brouwers, 1993). Scientists tend to regard an experiment as an enquiry during which all the variables are highly controlled except the variables under the study. Local people differ from the scientists' way of

experimenting in the sense that the experiment has to be included in daily circumstances (Kajembe, 1994).

Richards (1988) concludes that in recent literature the experimenting, innovative, adaptive peasant farmer is now accepted as a norm not the exception. His own pioneering work has made a substantial contribution to this change of attitude. He has given numerous examples from West Africa, including labour organisation and rice cultivation in swamps (Richards, 1985).

From an actor-oriented perspective, both scientific and indigenous knowledge are fragmentary, partial and temporal. Both scientific and indigenous knowledge are constantly being generated and constructed as products of dynamic processes of interaction between various actors with different cultural backgrounds and understandings (Katani, 1999). Advocates of an actor-oriented perspective recognise the fact that multiple actors do exist in natural resource management and rural development at large. Knowledge is not just a commodity which can be transferred from one actor to another but the outcome of a process which is a result of negotiation on the "social interface" between multiple actors (Long and Villareal, 1994).

In this perspective, local actors, (individuals or groups) should be seen as situated agents (Kajembe, 1997). Within limits of existing information, uncertainty and other constraints (e.g. physical, social and Politico-economic), local actors are knowledgeable and capable (Chambers et. al. 1989). They attempt to solve problems, learn how to intervene in the flow of social events around them, and monitor continuously their own actions, observing how others relate to their behaviour and taking note of various contingent circumstances. Human agency, or the capacity to devise ways of coping with life, plays a role in the way actors create new possibilities.

5 AREAS OF FURTHER RESEARCH WITH REGARD TO ITK AND NATURAL RESOURCES MANAGEMENT

In contrast to medicinal plants and agroforestry tree species, there has been little methodological scientific analysis in Tanzania on the implementation of ITK in other fields of natural resource management such as in soil fertility and conservation. However it is a known fact that as far back as 1970s some work was being done in agronomic and economic rationale of ridging, shifting cultivation, and multicropping (McCall, 1996). There are also gaps in the research in pest management and disease control.

Traditional beer-brewing, a major economic activity of rural women in Tanzania, has been totally ignored. Furthermore, very little attention has been given to the impact of AIDS to the productivity capacity of indigenous farming systems, and to the coping strategies that have unfolded. Technical Indigenous knowledge can easily be lost; thus lunar influences on crop and livestock growth and traditional weather forecasting are seen as folklore (McCall, 1996).

6 CONCLUSION

Promising methodological directions for representing ITK and formal modelling of its concepts and structure have yet to be taken seriously in Tanzania. For instance, the scope for representing spatial indigenous knowledge by means of Geographical Information System (GIS) has not yet been explored. Some categories of ITK such as soil classes, erosion hazards and the utilisation of woodlands and rangelands can easily be transformed in GIS formats. Other types are less amenable because of their scale, their complex constructs or the problem of distinguishing between categories, for example, land tenure rules and common property management regimes. ITK can be instrumental in empowering local people. Whatever the legitimacy or legality of ownership, we cannot disregard the potentials of ITK for promotion some degree of empowerment. At the very least, using ITK can prevent the mistakes which have resulted from incompetent management of natural resources. At its best, the marriage of outsider and insider knowledge systems can be truly synergistic, creating technological improvement in such areas as agroforestry, varietal selection, and soil moisture conservation.

7 REFERENCES

Brouwers, J.H.A.M., 1993. Rural People's Response to Soil Fertility Decline. The Adja case (Benin). PhD dissertation. Wageningen Agricultural University papers 93 - 4, Wageningen, The Netherlands.

Chambers, R.A. Pacey and L.A. Thrupp, (1989). Farmer First: Farmer Innovation and Agricultural Research. Intermediate Technology Publications, London, UK. 218 p.

Edje, O.T. and Semoka, J.M.R., (1990). Traditonal systems of Soil Fertility maintenance with special reference to Bean: In Proceedings of the 9th SUA/CRSP and second SADCC/CIAT Bean Research Workshop Serioes No. 12 held at Sokoine University of Agriculture, Morogoro, Tanzania 17-22 September, 1990. Bean Research Vol. 5.

FAO, (1993). Challenge of Sustainable Forest Management. FAO. Rome 128pp.

Giddens, A., (1987). Social Theory and modern Sociology. Polity Press in Association with Basil Blackwell, Oxford, U.K.

Inglis, J.T., (ed), (1993). "Traditional Ecological Knowledge: Concepts and Cases". International Program on Traditional Ecological Knowledge and International Research Centre, Ottawa, Canada.

Kajembe, G.C., (1994). Indigenous Management Systems as a basis for Community Forestry in Tanzania: A case study of Dodoma Urban and Lushoto Districts. Tropical Resource Management Paper No. 6. Wageningen Agricultural University, The Netherlands. 194p.

Kajembe, G.C., (1997). Perspectives on "How Local Knowledge can be utilized for Sustainable Natural Resource Management". Proceedings of the Regional Refresher course for the Alumini of the International Course on the Design of Community Forestry (ICDCF) from Africa held in Nairobi Kenya, February 17 - 28 1997. International Agricultural Centre, Wageningen The Netherlands pp 18-22.

Kajembe, G.C., and **K.F. Wiersum,** (1998). Bridging the gap between Indigenous initiative and externally sponsored forest interventions: In Chamshama, S.A.O (ed). Special Issue, Proceedings of the 1st Annual Forestry Research Workshop. Record No. 67. Faculty of Forestry, Sokoine University of Agriculture Morogoro, Tanzania pp 95 - 105.

Kajembe, G.C., and J.F. Kessy, (1999). Evaluation of Forestry Extension Services in Mwanza and Tabora Regions, Tanzania. Consultancy report submitted to the Ministry of natural Resource and Tourism. Forculsult, Faculty of Forestry and Nature Conservation, Sokoine University of Agriculture Morogoro, Tanzania (unpublished).

Katani, J.Z., (1999). Coping Strategies Against Deforestation: Impact of socio-economic Factors with special attention to Gender-Based Indigenous Knowledge: A case study of Mwanza District. A dissertation submitted in partial fulfilment for the degree of Master of Science in Forestry of the Sokoine University of Agriculture, Morogoro, Tanzania.

Kihwele, D.V.N., (1994): Beekeeping and Sustainable Management of Natural Forest Resources. A case study of Tanzania. Paper presented in the workshop on information acquisition for sustainable Natural forest resources of Eastern, Central and Southern Africa. Arusha 31/10 - 04/11/1994. pp 240 - 241.

Long, N. and **M. Villareal,** (1994), "The Interweaving of Knowledge and Power in Development Interfaces". In: Scoones, I. and J. Thompson (eds). "Beyond Farmer First". Intermediate technology publications. London, UK.

Makali, S., (1998). Community Based Forest Management: A case study of Dodoma Rural District. A special project report submitted in Partial fulfilment of the Bachelor of science degree in forestry of Sokoine University of Agriculture Morogoro, Tanzania.

McCall, M.K., (1996). ITK in East African Farming Systems: In Indigenous Knowledge and Development monitor Vol. 4 issues.

Rhoades, R. and **A. Bebbngton,** (1998). Farmers who experiment: An untapped Resource for Agricultural Research and Development? International Potato Centre (CIP), Lima, Peru.

Richards, P., (1985). Indigenous Agricultural Revolution. Hutchinson and Co, London, UK.

Richards, P., (1988). Experimenting Farmers and Agricultural Research. Paper prepared for ILEIA Workshop on Participatory Technology Development, ILEIA, Rietbergen, S. (ed) 1993.