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# Revisiting the Role of Local Knowledge in Natural Resource Management

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**Abstract**

The murky outcomes of development initiatives around the world, steered by dominant liberal discourses, have drawn scientists', researchers' and policy makers' attention towards reinvigorating the potential role of local or traditional ecological knowledge in the development process. Our understanding with respect to the process of development has, thus, considerably evolved over the past few decades. For instance, contrary to top-down approaches, contemporary development policy and praxis emphasize bottom-up approaches which recognize local people as key stakeholders and foster their participation in the decision making processes. Natural resource management (NRM) has invariably served as an important foci for development policy makers and practitioners alike. This article attempts to examine the potential role of local or traditional ecological knowledge in the management of natural resources by undertaking a rigorous review of existing literature. The findings evince that local or traditional ecological knowledge takes center-stage in the development process by enhancing local people's participation in the decision-making processes. Participation gives ordinary local women and men the leeway to exercise substantial influence over the decisions affecting their lives. Participation ultimately precipitates in empowerment of such groups living with in the society. Some examples of indigenous knowledge management systems described in the article illustrate how best local people can manage their resources in a more sustainable way. The article also discusses the potential limitations of local knowledge.

**Key words:** Local knowledge or traditional ecological knowledge, sustainable natural resource management, participation, empowerment, developing countries.

## Introduction

Natural resources may be defined in a number of ways. Generally speaking, natural resources refer to all those materials that occur in nature and are essential or useful to humans. Examples may include water, air, land, forests, fish and wildlife, top-soils, minerals. Some of these resources can be regenerated after utilization. Such resources are called renewable resources e.g. forests, fish, wildlife. Others that cannot be regenerated after utilization are called non-renewable resources. Examples of such resources may include coal, oil, natural gas and minerals. It is beyond any doubt that humans are dependent on natural resources for their livelihoods. However, due to increased population growth rate, there has been an increase in the pressure on the natural resources of our planet.

The rate at which the natural resources are being exploited is far greater than the rate at which they are being replaced. There is a need for sustainable management and utilization of these resources. The word sustainable in this context means that anything removed should be replaced so as not to harm the ecological system. Policy makers have devised a number of resource management strategies for this purpose. However, the outcomes of a number of such strategies have not been satisfactory. Now there is growing tendency to look for solutions to the management problems in the 'local or traditional ecological knowledge'. This article is an attempt to analyze the importance of local knowledge in the management of natural resources. In so doing, it will take into account the perceptions of scientists, researchers and policy makers on the local knowledge. In order to augment the notion that how best the indigenous management systems manage their resource in a sustainable way, the article attempts to illustrate some examples of the traditional resource management systems. In the end the article also focuses on the potential limitations of the local knowledge.

## What is local knowledge/traditional ecological knowledge

According to Olsson and Folke (2001), the knowledge held by a particular group of people about their local ecosystems is called local ecological knowledge (LEK). LEK may be a mix of scientific and practical knowledge. It is site specific and involves a belief component. Traditional ecological knowledge on the other hand is defined as "a cumulative body of knowledge and beliefs, evolving through adoptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment" (Berkes, 1999). Local ecological knowledge differs from the traditional ecological knowledge in the sense that it does not have a continuous historical and cultural connection with the ecosystem and resource use.

## Local ecological knowledge and natural resource management

According to North (1990) knowledge, institutions and organizations are three fundamental pre-requisites for economic development. Gunderson (1999) urges that institutions should have the ability to adjust themselves to the changing environmental conditions. Berkes and Folke (1998) suggest that for institutions to be able to respond and adjust to the changing environmental conditions, they must have an understanding of the ecological knowledge and ecosystem dynamics. Johannes (1978, 1998), Gadgil et al. (1993), Berkes et al. (1995), all agree that local ecological knowledge if combined with the scientific knowledge could prove significant in the ecosystem management. Hollings (1978) resembles locally evolved resource management systems as natural experiments where learning is enhanced by doing. Such systems use experimental knowledge (not in the scientific sense) for resource management. Experimental knowledge provides the basis for the paradigm of adaptive management of complex ecological systems. According to Pinkerton (1989) and Pomeroy (1995) adaptive management uses both local and scientific ecological knowledge for the co-management of resources and ecosystems.

Chambers et al. (1989) has rightly pointed out that agricultural and resource management projects in the past were based on top-down transfer of expert knowledge from research institutions to the intended beneficiaries. In designing and introducing new farming packages little attention was paid to understanding farmers' practices, knowledge, needs and problems. Extension activities were considered as a means to increase farmers' adoption of the new technologies. It is, however, evident now that local knowledge is a valuable resource for sustainable development. Its role in the development programmes should be central. People depending on natural resources have the ability to constantly adapt themselves to their environment even in harsh and insecure conditions. They know how to use the resources in a sustainable way.

According to WCED (1987) Western resource management approaches are most appropriate for the temperate ecosystems. Applying such management approaches elsewhere could prove less effective. For example, a number of tropical marine ecologists have pointed out that the fishery management designed for the characteristics of the North Atlantic were not suitable in the tropical marine ecosystems. The results could be the same in the managementof other resources like forests, arid lands, mountains etc in the tropics. Hence the indigenous people have a long term experience and understanding of their environment, consequently their knowledge could be of relevance in the management of resources in tropical forest, mountain and arid ecosystems.

Hechts (1990) argues that scientific knowledge is indeed helpful in providing information to the farmers upon which they can make decisions. It is, however, still questionable to rely on experimental scientific methodology alone in understanding about the sustainable management of agro- ecosystems. Using imported concepts and scientific interpretations for improvements in tropical agriculture have had limited success. This has helped in realizing the fact that because of the long interaction of the local people with their soils, their knowledgeof soils can provide many insights about managing tropical soils in a sustainable way.

In connection to the slow progress of rural change and ineffectiveness of the development strategies in developing countries, Chambers (1983) draws our attention to the fact that the approach used in such strategies is the 'top-down' approach. In contrast to the 'top-down' approach, the 'bottom-up' approach has become increasingly popular among the governments' as well as development agencies because it is more democratic and ensures people's participation. For achieving sustainable development, the development projects must involve the local people as partners in the designing, planning, implementation and evaluation processes. Johnson and Walker (2000) and Burroughs (1999) consider public participation as an important component of environmental management planning, decision-making and implementation. Public participation is important both at the planning as well as management phase in the natural resource management projects (Davis et al., 2001a; Moore et al., 2001 and Kapoor, 2001). Local people can participate in the resource management activities in a number of ways. One way to participation is to provide local knowledge of their environment.

**The salience of local knowledge**

Scientists and researchers in general accept the reality that there is a lot to learnfrom the local people. Dialla (1993) urges that soil conservation builds on local soil knowledge. Scientists, therefore, must incorporate local soil knowledge in their work. Scott and Walter (1993) demonstrate that integrating local knowledge with scientific can be useful in controlling soil erosion in Himalayas. Scientific knowledge in this case offered some short-term solutions to control soil erosion i.e. through structural and vegetative alternatives. Local knowledge, on the other hand, focused on the need to change the land use patterns for decreasing soil erosion which will be significant in the long run. They concluded that each method by itself was not effective. However, after combining the two, an effective soil erosion prevention strategy was developed and implemented in the area.

Local knowledge has been an area of interest for researchers especially those involved in sustainable land management. In designing policies for maintaining sustainable land use practices, due importance is given to the knowledge and experiences of small scale producers (Chambers, 1993; Blaikie and Brookfield, 1987). Local knowledge and development have been the focus of research during recent years and this trend will continue in the long run as well (Atte 1992; Brokensha et al. 1980). Local soil knowledge has got attention of researchers working in sustainable land management projects. The aim is to incorporate indigenous knowledge and participatory approaches in sustainable land management projects. Both scientists and researchers have now realized the fact that local people possess sophisticated knowledge about soils which prove significant in sustainable land use and in maintaining soil quality (Rajasekaran and Warren, 1995).

**Examples of traditional resource management systems**

**Nomadic pastoralists from Nyisonyoka Turkana (Kenya)**

Traditional ecological knowledge systems help to increase land productivity. Reid and Ellis (1995) conducted a study in Ngisonyoka Turkana of Kenya. The focus of the study was nomadic pastoralists who had a traditional life style at the time the study was conducted. The pastoralists in the area often kept sheep, goats and camels in circular enclosures. They moved the animals with the seasons, about once a month on the average. Acacia seedpods are important part of the livestock diet in the area. Some of the seeds which had not been digested by the animals were returned to the soil in the corrals.

Once the pastoralists moved their animals to new corrals, the researchers observed dense circular patches of seedlings of Acacia tortilis in the old corrals. They compared Acacia growth in the abandoned corrals with that in controlled plots and found that seed density was eighty five times higher in corrals than in control plots. They also found that as compared to the controlled plots, the corral soils were rich in organic matter like carbon, nitrogen and phosphorous and that its moisture retaining capacity was also high. From their study, Reid and Ellis concluded that in a similar vein, livestock management might have affect tree (forest) growth in some African environments.

**Lagoon management system from the Negombo estuary in western Sri Lanka**

Coastal lagoons being productive environments can be a source of livelihoods in the tropical areas. Lagoon resources in different geographical areas are utilized under sophisticated local governance systems. Amarasinghe et al. (1997) has describes one such example from the Negombo estuary in western Sri Lanka. Kattudel or the "stake-seine is the kind of fishing operation carried out in the Negombo lagoon. The

target fish is a high value shrimp, Metapaneus dobsoni. There were twenty two fishing sites on mouth of the lagoon at which sixty-five nets could be used at a time. The traditional fishing rights to these sites trace back to the eighteenth century (and possibly to the fifteenth century). The villages around the lake have four Rural Fisheries Societies (RFS).

Members of the RFS control the fishing rights. The Rural Fisheries Societies were based on elaborated rules. The kattudel fishery has 306 members out of 3000 fishers. The twenty two fishing sites were used on a turn bases by the RFS members. Tuns were allocated on the basis of a lottery system. Sites were exchanges by the member so that others can also have access to a better site. This example shows that the fishery resources in Negombo lagoon were maintained by limiting the number of members through legal enforcement. The kattudel case shows that lagoon fisheries and associated traditional management systems can be sustainable over long periods.

**Integration of rice-field fishery and tambak systems for combined production of rice, fish and downstream products in Indonesia**

Indonesia has a number of rice-field fisheries and water management systems. Some of these systems like tambak (brackish water fish ponds) dates back to the fifteenth century. Subak is another system for the management of irrigation water resources. The traditional systems integrated both the tambak system as well as the rice-field fishery. This integration resulted in the downstream flow of nutrient rich wastes from the rice-field fishery into the tambak and finally into the coastal area thus enriching the coastal fishery. This system was best suited for the combined production of rice, fish and downstream products and remained sustainable for several centuries (Costa-Pierce, 1988).

**Limitations of local knowledge**

According to Cook et al. (1998) besides a number of benefits of local knowledge like its high local relevance, its potential sensitivity to the complex environmental interactions, problems may arise while using it. For example, local definitions can sometimes be inaccurate and unable to cope with environmental change. Furthermore, as compared to scientific knowledge, which is more precise, local information can be relatively imprecise.

The distribution of local knowledge across a community is not equal. Different individual may have different level and type of the local knowledge. This can be a disadvantage for the people participating in resource management activities. The unequal distribution of local knowledge is largely due to its communication pattern. Similarly being a part of the power-relations structures with in a community, certain individuals might be excluded to acquire this knowledge. Because local

knowledge is held by a particular group of people, its sometimes difficult for the outsiders to understand it and get access to it. Since it is location specific, it may not necessarily be useful in other agro-ecological or socio- economic situations. Furthermore, it may not necessarily offer a solution to the changing external conditions (FAO, 2004).

**Concluding Remarks**

One of the major reasons of the failure of development projects during the past few decades has been the use of top-down approaches in the management and implementation of the proposed projects. The 21st century has witnessed some major shifts in development thinking. For instance, instead of using top-down approaches, development today uses bottom-up approaches in the implementation and management of projects. The bottom-up approaches take into account the knowledge of the local people by involving them in the envisaged activities. The track record of the use of scientific knowledge alone in the management of natural resources does not have any promising outcomes. Local or traditional ecological knowledge, on the other hand, might play a potential role in the management of natural resources because it helps in better understanding of the local situations and problems. Similarly, it also enhances local people's participation in resource management activities which in turn empowers them to influence the decision-making processes. It is, therefore, deemed necessary to integrate both the scientific and local knowledge rather than to rely on scientific knowledge alone, for a more sustainable management of natural resources.

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