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## **Strengthening Community-based Conservation through Traditional Ecological Knowledge**

Shaileshkumar Shukla  
Natural Resources Institute  
University of Manitoba  
Winnipeg, MB R3T 3N8, Canada  
*E-mail* umshukla@cc.umanitoba.ca

Community-based conservation (CBC) has recently emerged as an innovative institutional response for meeting the seemingly conflicting goals of poverty reduction and biodiversity education. It is also recognized that an important component of CBC is drawing on the traditional ecological knowledge held by local people that is already proving itself in the management of local resources. In fact, some CBC scholars (e.g., Berkes 2003) consider the use of local knowledge systems such as traditional ecological knowledge (TEK) as one of the enabling conditions that leads to the success and durability of CBC. The proposed study explores the potential roles TEK could play in strengthening CBC through promotion of contextual factors such as self-organization and cross-scale interactions. The approach taken is through a case study of the Medicinal Plant Conservation Center (MPCC), Pune that was honored by the Equator Initiative of United National Development Program (UNDP) as one of the twenty-seven outstanding CBC initiatives in the year 2002.

The use of TEK is evident in MPCC, Pune efforts through the identification of some 50,000 plants, representing more than 50 different species, undertaken by a network of local knowledge healers in partnership with local tribal communities, local Non-governmental organization (NGOs), and the state forest department. MPCC has instituted some innovative participatory ways of working with local communities. The study will contribute to the emerging literature on community-based conservation, local knowledge systems for promoting social learning, and will have wider implications for re-designing strategies for effective community-based Conservation through TEK.

### **Community-based Conservation: Balancing Conservation and Development**

***People-centered approaches for biodiversity conservation:*** Contemporary discourse on natural resources conservation and development is dominated by three major paradigms: the Classic approach, the Populist approach, and the Neo-liberal approach (Blaike et al. 1997; Brown 2002). All three approaches see human and natural resources linkages differently. The *classic* approach considers people as threats to biodiversity. The *populist* approach stresses empowerment and participation of the local community as keys to sustainable conservation and development. The *neo-liberal* approach, which has been much in debate recently, recognizes institutions, policies, and markets as economic incentives to local people for

sustainable biodiversity conservation (Adger et al. 2001). This emerging view of the neo-liberal approach also forms part of the “new conservation” dialogue (Hulme and Murphree 1999) that advocates for people’s participation in conservation through market-based approaches. However, the neo-liberal approach or new conservation has been criticized by some scholars on two main grounds: First, the new conservation is seen as re-inventing the wheel of old-styled conservation that is still top-down rather than being democratic and participatory (see, for example, Brown 2003). Second, purely economic incentives, as envisaged in the neo-liberal approach, are considered inadequate and perhaps irrelevant from a community’s perspective. For example, some writers and proponents of protection of the intellectual property rights<sup>1</sup> for communities that have conserved biodiversity for ages argue that there has been a mismatch about the perceptions of incentives (or benefits) between conservationists and the community as a knowledge holder (Gupta 1998; Brown 2002). As a result, incentives in terms of pure economic forms are viewed as “too narrow,” “too simplistic,” and “potentially counter-productive” (Berkes 2003).

The neo-populist approach (which broadly covers the aspects of both populist and neo-liberal approaches) advocates for sustainable use and empowerment strategies to achieve the twin goals of biodiversity conservation and human welfare, rather than seeing them as conflicting (Melissa, Personal communication, January 2003). The practical applications of this thinking can be seen partly in the integrated conservation and development programs (ICDP) of the 1980s, wildlife use approaches of the 1990s, and community-based conservation initiatives more recently. Both ICDP and wildlife-use approaches have been mainly inclined to the conservation and development of protected areas and biodiversity within them (Brown 2002). Community-based conservation has some competitive advantages over the other two approaches. First, it is wider in focus and applicability, in terms of the variety of biodiversity it seeks to conserve. Second, it also helps achieve the equally important goal of poverty reduction. And, finally, it acknowledges the role of non-monetary incentives for encouraging conservation, such as community empowerment through people’s own knowledge and the sharing of power.

These features of community-based conservation reinforce and broaden the scope of the neo-populist approach, both in conservation and in development, and establish its prevalence over the other approaches in contemporary discourse on conservation. This has been very recently exemplified in the institutional mechanisms of adaptive co-management (Kenderick 2003) in Canada and in the recognition of community-based conservation initiatives across equatorial regions (UNDP 2002).

In order to better understand the concept and practices of this tradition and its relation to community-based conservation, various interdisciplinary sub-fields—such as common property, traditional ecology, political ecology, ecological economics, and environmental ethics—have evolved through the 1970s and 1980s (Berkes 2003). These sub-fields helped enhance our understanding of the linkages between social systems (human) and ecological systems (nature). An analysis grounded in such new fields could be useful in understanding not only the linkages of social and ecological systems but also the conditions governing the effective functioning and sustainability of community-based conservation initiatives.

***What makes community-based conservation work?*** Ostrom et al. (1999) reviewed the global

commons governing natural resources and concluded that lessons from successful common property resource institutions could provide a good starting point to tackle future challenges. However, it has also been realized by some common-property resources scholars like Berkes (2003) that, in the case of community-based conservation initiatives, understanding the conditions under which such initiatives have worked would be more important than evaluating their success. He focuses on the five most important characteristics that contribute to the effective functioning of the community-based conservation initiatives. These include:

- the importance of cross-scale interaction
- adaptive co-management (through self-organization)
- the question of incentives and multiple stakeholders
- use of TEK
- the development of cross-cultural ethics.

The self-organization aspect is the one of the key evolutionary characteristics of all living systems and is widely applied to attempts to describe and understand the sustainability of complex and linked social-ecological systems like community-based conservation. The differential capacities of such complex systems to self-organize may contribute to the diversity of community-based conservation institutions that exist in different ecological locations (Gunderson and Holling 2002).

Cross-scale interaction is another generic feature of complex social-ecological systems like community-based conservation. The cross-scale view of community-based conservation could provide a basis for accommodating diverse actors and their values and knowledge into decision-making and management of a given natural resource or, in other terms, social learning. Berkes (2002) has suggested the mechanisms for strengthening local level institutions for cross-scale interactions. These include

- recognition
- legitimization and legislation of the local community-based conservation institutions by the state
- cultural and political revitalization
- capacity building of various actors for crafting new institutions

The most common forms of cross-scale institutional solutions are found in the examples of partnership between local users or groups with government, as found in co-management arrangements in Canada, joint forest management in India, and implementation of aboriginal resource rights in the United States, New Zealand, and Australia (Berkes 2000). There are several kinds of institutional forms (such as multi-stakeholder bodies, citizen science, policy communities, etc.) and research approaches (ecosystem management, adaptive management, etc.) that facilitate and speed-up the cross-scale interactions. Berkes (2002) concluded that cross-scale institutional linkages should be designed in a manner that facilitates self-organization in cycles of change and enhances social learning. The change or surprises (for example, natural calamities) that occur therefore provide an opportunity to the local users or members of the community to self-organize by making the use of local knowledge systems, including TEK.

While it is useful to understand self-organization, cross-scale interactions, and TEK as enabling conditions or factors for making community-based conservation successful, it also

has been recognized that these initiatives often do not perform equally well in achieving the intended goals of biodiversity conservation and poverty reduction. Kellert et al. (2000) evaluated community-based conservation initiatives in Nepal, Kenya, and the United States, and found that human development goals like equity and empowerment are achieved more frequently than biodiversity conservation goals. In the study of community-based conservation for African wildlife protection, simultaneous achievement of social-economic and conservation goals also were found to be far more complex and difficult to attain. TEK thus could help empower local communities to manage given natural resources in a sustainable way. Some other literature on community-based conservation also concurrently supports this vision, and suggests that building upon local knowledge systems with regard to conservation of biodiversity helps in creating a long-term stake for the local community to conserve the resources in question (Brown 2002; Berkes and Jolly 2001).

### **Traditional Ecological Knowledge: Concept and Contributions**

More than three-quarters of the world's population rely on local knowledge systems to meet their medicinal needs, and at least half rely on local varieties and associated knowledge systems for their food supplies (RAFI, 1995 as quoted in Walsh 2003). This knowledge is popularly known as TEK and is a sub-set of indigenous knowledge. TEK may be defined as “a cumulative body of knowledge, practice and belief, evolving by adaptive processes and handed down through generations by cultural transmission” (Berkes 1999:8). TEK also is considered a sub-set of indigenous knowledge—which is commonly defined as unique, traditional, local knowledge, and learning systems existing in and developed by groups of people who are indigenous to a specific geographical area or region (Grenier 1998).

TEK is conceptualized in many ways—from its role as a livelihood strategy in poor tribal communities (Gupta 1990) to its management implications for contemporary natural resource management (Johannes 1989; Ruddle 1993; Grenier 1998; Berkes 1999). Berkes (2000) explores the role of TEK in managing the processes and functions of complex social-ecological systems as parallel to adaptive management. He further suggests that TEK is largely dependent on hierarchal social mechanisms.

Traditional ecological knowledge can be operational at four inter-related strata. The *first* stratum starts at the village/local level, which includes the knowledge of local plants, animals—their identifications, folk taxonomies, uses (ethnobotany), etc. This sort of knowledge is largely based on diachronic observations, and therefore has been able to survive through ages. At the *second* level, TEK exists in the form of land or resources management systems, which is inclusive of the first level and requires additional understanding of the functional relationships among various species and/or ecological processes. The *third* level of analysis requires TEK embedded in the social institutions or informal rules in use as practiced by communities or groups having a common stake and interdependence in the resources, such as hunters, pastoralists, fishermen, etc. The *final* stratum of TEK analysis includes the worldview, which shapes the belief systems and shapes our interpretation of our surrounding world.

These levels are not distinct, and sometimes they intermingle so tightly that they may appear to be the same. For example, it is indeed hard to draw a boundary between social institutions and management systems in the same village if the informal institutions are managing the same resources for sustainable use. These levels thus are mutually passive on

feedbacks and thereby generate learning, which help them survive through adaptation in the event of change or crisis. These features of TEK systems have parallels with the feedback learning or adaptive learning as often found in the linked and complex socio-ecological systems such as CBC.

### **Building Resilience: Ways To Sustain Community-based Conservation Initiative**

Social-ecological systems such as CBC are complex in nature and therefore exhibit certain characteristics such as non-linearity, uncertainty, emergence, scale, and self-organization (Gunderson and Holling, 2002; Berkes 2003). The resilience is also an important concept, for it helps social-ecological systems to sustain themselves in the long run. Resilience, or the capacity of a system to withstand and to adapt to the external disturbances, is a useful concept for understanding how a society can sustain itself in times of social, political, economic, and/or environmental changes (Berkes et al. 2003). The resilience of a particular social-ecological system expresses three defining characteristics: 1) the amount of change a system can absorb and still retain the same controls on functions and structures; 2) the degree to which the system is capable of self-organization; and 3) the ability to build and increase capacity for learning and adaptation (Resilience Alliance 2003). Community-based conservation systems, therefore, should aim to build resilience.

Folk et al. (2003) has outlined the following four major factors that interact among themselves across time and space in order to contribute towards the sustainability of natural resources in social-ecological systems. All of these factors follow certain mechanisms or ways to achieve their objectives of building resilience and adaptive capacities, as described in the following steps:

*Learning to live with change and uncertainty.*

- Evoking disturbances
- Learning from crisis
- Expecting the unexpected

*Nurturing diversity for reorganization and renewal.*

- Nurturing ecological memory
- Sustaining social memory
- Enhancing social-ecological memory

*Combining Different systems of knowledge for learning.*

- Combining experiential and experimental knowledge
- Expanding from knowledge of structure to knowledge of function
- Building process knowledge into institution
- Fostering complementarities of different knowledge systems

*Creating opportunities for self-organization.*

- Recognizing the interplay between diversity and disturbances
- Dealing with cross-scale dynamics
- Matching scales of ecosystems and governance
- Accounting for external drivers

While all four factors play major roles in building resilience and the adaptive capacity of the social-ecological systems, in this paper, the third factor, i.e., combining different systems of knowledge is discussed.

From the management perspective, it is a useful idea to have all forms of available information collected, compiled, and put to use. The management of complex social-ecological systems such as CBC is no exception. There are four ways to combine different systems of knowledge for learning:

(1) The first way is to combine different systems of experiential knowledge. Local communities derive their local system of knowledge, such as TEK, through historical observations of a particular ecosystem. It is based on experiences; practical, iterative, and rooted in a particular place. The other systems of knowledge are formal or scientific, which have been mostly intentionally developed and are subject to laboratory and field experiments. The formal disciplines of botany, ecology, zoology and their subsequent applied fields are the most commonly used formal or experimental knowledge applied to improve our understanding of natural resources.

(2) The second mechanism is expanding from the knowledge of structure to a knowledge of functions. The understanding of management practices (the level 2 of figure 1) helps explain the role of various ecological resources and the functional relationships among them. It also imparts an understanding of how communities or societies have been able to survive and adapt in the wake of changes or crises.

(3) The third way is to build process knowledge into institutions. The management practices are often embedded in local community-based institutions and social networks (level 3 of figure 1). The knowledge of ecosystem processes and functions requires a longer association of communities with particular place. The process of learning, in this case, is continuous and through trial and error. The collective learning taking place at the community level often gets stored as social memory in the form of local informal institutions or networks. This social memory provides useful feedback in the form of learning based on previous experiences during crisis and thus nurtures ecological memory, which is responsible for the sustainability of social-ecological systems. The knowledge system (such as TEK) itself becomes part of the social or ecological memory available to deal with crisis.

(4) The last way is to create complementarities between two systems of knowledge for successful and sustainable management of natural resources. Folk et al. (2003) have indicated three ways in which TEK can complement conventional resource management: 1) qualitative monitoring/management, 2) building resilience, and 3) providing long-term observation and institutional memory for understanding ecosystem change.

In order to create a scope of mutual learning between both these knowledge systems, it is useful to understand and compare their features (see Table 1). However, some scholars contend that making such divisions is not useful and can even be disastrous (Gupta 1999; Letsoko 2003). A synthesis of both as complementary to each other is therefore suggested and has been attempted by philosophers, scholars, and practitioners of various disciplines, as well as international agencies such as UNESCO and UNEP. In the field of natural resources management and environment education, the complementary nature of TEK and formal knowledge have been debated in the works of Colorado and Collins (1987), Corsiglia and Snively (1995), Saloman (1996), Berkes (1999), Richards (1997) and UNEP (1998) as quoted in Kimmerer (2002). Both these knowledge systems have their own advantages and limitations, but they can enhance one another's capabilities if complemented. The important point is to build bridges between these two so as to create "knowledge in action" (Brown 2003).

The next section is based on field interactions that were held with an NGO based in Pune, Western India, viz. the Rural Commune’s Medicinal Plant Conservation Center (RCMPCC), and some of the approaches that RCMPCC used in Western India. The preliminary findings<sup>2</sup> from the field studies with RCMPCC reported here have been made with specific reference to the ways in which RCMPCC has combined local ecological

**Table 1: Local knowledge (LKS) and Scientific Knowledge (SKS).**

LKS	LKS AND SKS	SKS
Holistic	<b>COMMONALITIES</b>	Mainly Reductionist
Traditional	<ul style="list-style-type: none"> <li>• Systematic Observation of Nature</li> <li>• Generation of Detailed and Empirical knowledge about natural phenomena and ecosystems</li> <li>• Predictive power</li> <li>• Cultural/regional context provides basis for interpretations</li> </ul>	Modern or scientific
Diachronic observation		Synchronic observations
Elders/communities are teachers		Trained persons/experts are teachers
Place-based /Situating in local context		School/Institution-based, Often De-contextual zed
Nature is subject		Nature is object
Can deal with complex social-ecological systems through interdisciplinary focus		Often fails to handle complexities because of single discipline orientation
Pedagogy is learning by doing/ Trial and error		Pedagogy is often classroom/field station based methods such as lectures or experiments
Transmission through oral and cultural means of communication and multi-generational		Transmission is limited to single generation through one-way communication and known communication media

*(Source: Based on Aggarwal 1995; Berkes 1999; Kimmerer 2002; Letsoko 2003)*

knowledge systems of the communities with formal scientific knowledge for the conservation and use of medicinal plants.

### **Rural Commune’s Medicinal Plant Conservation Center: Case Study**

The RCMPCC is a program of Mumbai-based rural communes for the in-situ conservation and sustainable utilization of the medicinal plants diversity of the Maharashtra state through developing partnerships among the forest department, local communities, and NGOs. To this end, the RCMPCC, in collaboration with other stakeholders, organized several activities such as the establishment of a network of thirteen MPCAs (each ranging from 250–400 hectares) in Maharashtra State and documented some 50,000 plants, representing more than 150 different species in these MPCAs through participatory approaches like the barefoot botanist program, the Conservation Assessment and Management Program (CAMP),<sup>3</sup> local healers' conventions and scientific assessments by the field botanists, and the establishment of local management structures such as local management committees (LMCs) and self-help groups (SHGs). RCMPCC organized a variety of training and capacity-building programs to strengthen LMCs, SHGs, local forest staff, and villagers to enable them to improve local livelihood and engage them in the sustainable conservation of medicinal plants through production, marketing, and local sale of herbal products (for details, see <http://www.rcmpcc.org/>). RCMPCC has also created a network of local healers, field botanists, forest department staff and interested villagers in Maharashtra to document and disseminate local knowledge of medicinal plants, which could also revitalize local health traditions. The MPCAs created through these projects were legally recognized by the state Forest Department of Maharashtra as conservation priority areas, and inspired other states and the Indian national Government to include them in their conservation and development agenda. The project was honored with the Equator Initiative award by UNDP in February 2002 for a range of innovative activities that were undertaken to meet the larger goals of biodiversity conservation and poverty reduction (for details, see <http://www.equatorinitiative.org/>).

RCMPCC realized that there is a group of individuals existing at village level (often known as *vaidus*<sup>4</sup>) who are recognized by the village communities as local knowledgeable experts or healers or ecological experts. These *vaidus* possess extraordinary knowledge and interest in the local plants, fauna, and ecosystems. Many of them also practice herbal treatments of diseased humans, cattle or crops, and have developed skills in identification and the use of locally grown plants. RCMPCC has tapped the creative potential of these barefoot botanists<sup>5</sup> or village botanists in the conservation and management of medicinal plant diversity through their sustainable uses (Village Biologist, Concept Note, RCMPCC, 2001). The RCMPCC has organized two main sets of programs: 1) *Vaidu sammelans*, or local healer conventions; and 2) a village botanist training program, through which the capacities of formal field botanists (some of whom are RCMPCC staff members), local healers, and communities have been strengthened through mutual exchange and hands-on learning experiences.

The major objectives of the **local healer conventions** were:

- To document and learn from the knowledge about the plants from *vaidus*.
- To encourage value addition activities to make some herbal drugs for local uses and local sale for income generation.
- To provide a platform for *vaidus* to showcase their herbal products and to promote exchange among other stakeholders.
- To provide opportunities to other practitioners of medicines—such as the local allopathic doctor, health worker, and midwife—to come to gather and discuss common issues of interest.

- To encourage the participation of vaidu healers in the local conservation efforts.

The **village botanist**, on the other hand, is a broader category. Village botanists were identified among all thirteen sites of RCMPPCC. Three to four village botanists for each MPCA were identified on the basis of following guidelines:

- Good knowledge of local plants and their uses, including their cultural significance (as judged by the community's level of consultation).
- Good interest in local plants, environment, and their conservation (as demonstrated by their earlier efforts).
- Should be able to read and write (desirable but not essential).

Most of the village botanists thus identified consisted of local healers (male and female), local forest guards, and local knowledgeable elders. The first two Village Botanists workshops were held in December 2000 and November 2001 by RCMPPCC. The third workshop was held December 16–18, 2003 at Amboli MPCA in Northern Maharashtra. The common objectives of these workshops were:

- To generate the checklist of plants found in the MPCAs in consultation with village biologists.
- To provide scientific and botanical information of local plants (botanical names, phenotypes, etc.).
- To demonstrate the herbarium preparation and related skills of plant specimen collection, identification, and handling.
- To generate and demonstrate the methods of documentation of plant-related information in the specified format.
- To promote the exchange of knowledge between village botanists and field botanists through discussions, displays, and dialogues.
- To seek the input of village biologists for improving the existing conservation programs.

The village botanists also were trained in botanical inventorying and participatory rapid assessment through specifically designed and implemented CAMP workshops.

The primary sources of the insights for this paper have come from the vaidus sammelans as well as the Village Botanists workshops. The outcomes and learning that have emerged from these consultations have been summarized in the following table, which draws on the four major ways through which different knowledge systems such as TEK of medicinal plants and formal scientific knowledge (in this case botany) can be combined to generate adaptive learning. The sequence of mechanisms is kept same as the framework suggested in Table 2.

**Table 2: RCMPPCC's ways of building resilience by combining different systems of knowledge.**

<u>Mechanisms/Ways</u>	<u>Evidence/Points demonstrated by RCMPPCC</u>
Combining experiential and experimental knowledge	The ten <i>vaidus</i> sammelans helped document the total uses of 326 plants. 415 plant-based formulations on 187 symptoms/illnesses also have been documented.
	Most of the village botanists in these workshops could list more than 100 plants, along with their uses, growing habits, and safest methods of extraction, which was also convincing to the field botanists.

In a recent workshop of local healers with school children, teachers, community leaders, and forest staff, a plan of conservation of medicinal plants for the Amboli village was outlined. In these workshops, women healers also joined. In general, the women healers are few in number and their skills are considered limited to pregnancy and cattle. In this case, these women healers transcended this perceived boundary and helped shape the conservation agenda.

Expanding from knowledge of structure to knowledge of function

Useful learning took place about developing indigenous ways of understanding the functions of ecosystems, such as the presence of plants and/or animals as eco-indicators or community-believed warning signals for conservation of biodiversity; for example, that the presence of a particular black spider indicates that quality of forest is good or the presence of particular plants species such as the *Umbad* tree indicates the existence of ground water, etc.

Another important area that this knowledge exchange helped was to understand the safest methods of extraction of plants. Senior healers often passed on these instructions through practice as to how to extract the bark or plant parts without damaging the plant and keeping its regeneration activities intact.

At the local level, the knowledge exchange and its use happened at the level of village, clusters of village, district and state level. These workshops often attended by the Forest Department officials from the district and state level. The plans of Forest Department are thus enriched by traditional knowledge of the healers. In the village botanist workshop organized at Amboli, two village botanists who eventually also were forest staff demonstrated the techniques to prepare a herbarium of 670 species in the last 2 years. They have also documented 805 medicinal uses of 420 of these species. Local forest staff prepared the inventory of locally available plants along with uses, local names and botanical names. The idea of converting MPCA into community health resource center was inspired from such initiatives. Some village botanists and Folk healers were also engaged in the micro credit SHGs and some were members of micro-enterprises of medicinal products in their respective villages.

Building process knowledge into institution

Local healers from different MPCA had the opportunity to get together on a common platform for the first time. The discussions, deliberations, and mutual learning that occurred during these interactions generated very interesting exchanges of ideas and the emergence of an informal network of local healers within a district.

Knowledge was also exchanged among the local healers/*vaidus* so far as conservation of the rare plant species is concerned. If fewer than a safe number of plants are left with in the village, the information is always passed on to the other healers of the same village and surrounding areas to keep vigil on those particular plants. This has led to the collective exploration by a group of concerned local healers for the alternative plants with similar properties and prompted them to initiate collective efforts for regeneration of the vanishing plants.

The village botanists or local healers were recognized publicly through such events. The certificate was given to all the participants of the village

Fostering complementarities of different knowledge systems

botanists program based on the oral tests measuring their skills on herbarium (collection, storage & application) and ecology (observation, conservation and use) with regards to medicinal plants. Such programs thus helped envision and build capacities of these local experts as “local research anchors” and “custodians of conservation.”

The traditional knowledge of healers with regard to medicinal plants also attracted the attention of the forest department. This was more remarkable in two districts, Ule and Sindhudurg, where the forest department and RCMPC published a Marathi language booklet with the list and uses of 100 Medicinal Plants from Sindhudurg. The botanical names and family as well as English names were also provided along with vernacular names. A separate list of 49 wild vegetables with local, botanical and English names was also appended in the book. In addition, the list of 113 local practicing healers or *vaidus* with their areas of specialization and addresses are described in the book. The book had been widely circulated among forest officials across state, other Government departments, Universities and scientific and NGOs. Many of the *vaidus* listed in these books were later invited by Forest Departments and local NGOs.

Local healers and formally trained field botanists of the RCMPC had interacted face to face on status, uses and conservation issues of medicinal plants. These exercises were mutually enriching and helped validate knowledge of *vaidus* and generated some new insights, which formally trained field botanists could further explore. Useful sharing also happened with regard to nomenclature (botanical and local names of plants), comparing known uses in the classified and codified texts versus uses reported by the local healers and in identifying priority species/areas for conservation through simple resource mapping and hands-on skills on making herbarium etc.

Two barefoot botanists from Amboli MPCA had recently guided researchers from International Tropical Timber Organisation (ITTO) from Japan and helped them organize transects by identifying suitable pockets.

## Conclusions

Community-based conservation has emerged as an important neo-populist agenda in the recent debate on conservation and development. The success and sustainability of complex social-ecological systems such as community-based conservation is dependent on how effectively it can build resilience through various mechanisms within social-ecological systems. One such mechanism is to create and nurture synergistic relationships between local knowledge systems such as traditional ecological knowledge (TEK) with conventional natural resource management. Environmental NGOs, like RCMPC from western India, have demonstrated the potential to forge such symbiotic partnerships between local healers, formally trained field botanists, the forest department, local communities, and other stakeholders through its innovative participatory approaches—such as the village botanists program and local healer workshops. Such efforts need to be encouraged and further examined in different socio-ecological and cultural settings.

## Endnotes

1. The monetary forms of incentives both at the individual and the community level are being handled internationally in the form of intellectual property rights by the World Intellectual Property Organizations, as suggested by Article 8(J) of the Convention of Biological Diversity (see Gupta, 1998).
2. Funding support from IDRC, Canada, and the University of Manitoba is gratefully acknowledged.
3. CAMP is a process developed by IUCN for identifying endangered species of the plants—"red listed"—and working out programs for their recovery and enrichment through participatory efforts at local level by the field botanists, local healers, villagers, forest staff, and NGO representatives through forest walks and trails. The participants engage in dialogue and combined understanding of local medicinal plants and their status.
4. The term *vaidus* is a generic folk term most commonly used in the Marathi and Hindi languages to describe local healers and traditional herbal practitioners; used most commonly, but not exclusively, to refer to male healers. Barefoot botanist or village botanist are the terms used interchangeably throughout this paper.
5. The Barefoot Botanist (BFB) program was initiated in 1995 with the original aim of enriching traditional skills with relevant modern botanical skills, for both local use and even modern practical applications such as guiding eco-tourists, health students, or researchers, etc.

## References

- ADGER, W.N., T. A. Benjamisen, K. Brown, and H. Svarstad, 2001. "Advancing Political Ecology of Community in Natural Resources Conservation," *World Development* 27:629–49.
- AGRAWAL, A., 1995. "Indigenous and Scientific Knowledge: Some Critical Comments," *Indigenous Knowledge and Development Monitor* 3(3):3–6.
- BERKES, F., 1999. *Sacred Ecology: Traditional Ecological Knowledge and Resources Management* (Philadelphia: Taylor and Francis).
- BERKES, F., 2002. "Cross-scale Institutional Linkages: Perspectives from the Bottom Up," in E. Ostrom, T. Dietz, N. Dolsak, P. C. Stern, S. Stonich and E. U. Weber (eds.), *The Drama of Commons* (Washington, DC: National Academy Press), pp. 291–321.
- BERKES, F., 2003. "Re-thinking Community-based Conservation." Personal communication.
- BERKES, F. and Jolly, 2001. "Adapting to Climate Change: Socio-ecological Resilience in a Canadian Western Arctic Community," *Conservation Ecology* 5(2):18.
- BERKES, F., J. Colding, and C. Folke, 2000. "Rediscovery of Traditional Ecological Knowledge as Adaptive Management," *Ecological Applications* 10:1251–62.
- BERKES, F., J. Colding, and C. Folke (eds.), 2003. *Navigating Social-Ecological Systems: Building Resilience for Complexity and Change* (Cambridge: Cambridge University Press).
- BLAIKIE, P.K., P. Brown, P. Dixon, M. Sillitoe, Stocking, and L. Tang, 1997. "Knowledge in Action: Local Knowledge as a Development Resource and Barriers to Its Incorporation in Natural Resource Research and Development," *Agricultural Systems* 55:217–37.
- BROWN, E., L. Tompkins, and W.M. Adger, 2002. *Making Waves: Integrating Coastal Conservation and Development* (London: Earthscan).
- BROWN, K., 2002. "Innovations for Conservation and Development," *The Geographical Journal* 168:6–17.

- BROWN, K., 2003. "Three Challenges for a Real People-Centered Conservation," *Global Ecology & Biogeography* (12)2:89–96.
- COLORADO, P., and D. Collins, 1987. "Western Scientific Colonialism and the Reemergence of Native Science," *Practice: Journal of Politics, Economics, Psychology, Sociology and Culture* (Winter):50–65.
- CROSIGLIA, J., and G. Snively, 2001. "Discovering Indigenous Science: Implications for Science Education," *Science Education* 85:6–34.
- FOLKE, C., J. Colding, and F. Berkes (eds.), 2003. *Navigating Social-Ecological Systems: Building Resilience for Complexity and Change* (Cambridge: Cambridge University Press), pp. 352–83.
- GRENIER, L., 1998. *Working with Indigenous Knowledge: A Guide for Researchers* (Ottawa, Canada: IDRC).
- GUNDERSON, L.H., and C.S. Holling (eds.), 2002. *Panarchy: Understanding Transformations in Human and Natural Systems* (Washington, DC: Island Press).
- GUPTA, Anil K., 1998. "Getting Creative Individuals and Communities Their Due: Framework for Operationalizing Article 8(J) and 10(C)." Paper Invited by CBD Secretariat. SRISTI: Ahmedabad, India.
- GUPTA, Anil K., 1999. "Conserving Biodiversity and Rewarding Associated Knowledge and Innovation System: Honey Bee Perspective." Invited paper for the First Commonwealth Science Forum—Access, Bio Prospecting, Intellectual Property Rights, and Benefit Sharing and the Commonwealth, Goa, September 23–25, 1999.
- HULME and Murphree, 1999. "Communities, Wildlife and 'New Conservation' in Africa," *Journal of International Development* (11):277–85.
- KELLERT, S.R., J.N. Mehta, S.A. Ebbin, and L.L. Lichenfeld, 2000. "Community Natural Resources Management: Promise, Rhetoric and Reality," *Society and Natural Resources* 13:705–15.
- KENDRICK, Anne, 2003. "Caribou Co-management in Northern Canada: Respecting Multiple Ways of Knowing," in F. Berkes, J. Colding, and C. Folke (eds.), *Navigating Social-Ecological Systems: Building Resilience for Complexity and Change* (Cambridge, UK: Cambridge University Press), pp. 241–69.
- KIMMERER, Robin Wall, 2002. "Weaving Traditional Ecological Knowledge into Biological Education: A Call to Action," *Bioscience* 52:432–38.
- LETSOKO, S.P., 2003. "Theory of Knowledge: Is the Idea of Local, 'Traditional' or 'Indigenous' Knowledge Plausible?" Paper presented at University of Witwatersrand, School of Education, April 2003 (accessed on 9 May 9, 2003 at <http://www.developmentgateway.org/download/187294/indigenous.doc>).
- MELISSA, M., 2003. "Livelihood in Context." Un-published PhD proposal. Personal communication.
- OSTROM, E., J. Burger, C.B. Field, R.B. Norgaard, and D. Policansky, 1999. "Revisiting the Commons: Local Lessons, Global Challenges," *Science* 284:278–82.
- RESILIENCE ALLIANCE, 2001. "The Resilience Alliance: A Consortium Linking Ecology, Economics and Social Insights for Sustainability," at <http://www.resilience.org/programdescription.htm> (accessed February 2002).
- RICHARDS, R.T., 1997. "What the Natives Know: Wild Mushrooms and Forest Health," *Journal of Forestry* (September):5–10.

- RURAL ADVANCEMENT FOUNDATION INTERNATIONAL (RAFI), 1995. *Conserving Indigenous Knowledge: Integrating Two Systems of Innovation* (New York: UNDP).
- RURAL COMMUNE MEDICINAL PLANT CONSERVATION CENTER (RCMPCC), 2001. *Gender Dimensions of Medicinal Plants Conservation Project: A Mimeo* (Pune, India: RCMPCC).
- SALMON, E., 1996. "Decolonizing Our Voices," *Winds of Change* (Summer):70–72.
- UNITED NATIONS ENVIRONMENT PROGRAMME, 1998. "Report of the Fourth Meeting of the Parties to the Convention on Biodiversity," Nairobi (Kenya): United Nations Environment Programme. UNEP/CBD/COP/4/27.
- WALSH, Susan, 2003. "Development Assistance Among JalQ'A Paperos in Potosi, Bolivia: From Trojan Horse Towards Strengthened Resilience." Draft Doctoral Dissertation. Winnipeg: University of Manitoba.

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