

**Interconnections among community-based conservation, local
knowledge and environmental education: Case studies from India**

By

SHAILESHKUMAR SHUKLA

A Thesis
submitted to the Faculty of Graduate Studies of
The University of Manitoba
in partial fulfilment of the requirements of the degree of

DOCTOR OF PHILOSOPHY

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University of Manitoba

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FACULTY OF GRADUATE STUDIES

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ABSTRACT

The results of community-based conservation are mixed and varied even though it has been advocated by scholars and promoted by international agencies for achieving human well-being and biodiversity conservation. This study explores the interrelationships among community-based conservation, local knowledge and environmental education. The experiences of two community-based conservation initiatives, local knowledge and environmental education are examined using a neo-populist conservation-development paradigm. Case study research was supplemented by a review of literature from three fields: a) community-based conservation; b) traditional ecological knowledge as a subset of local knowledge and its transmission; and c) environmental education with a focus on local resources conservation and sustainable development. Using a mixed-model research design, two villages (one each from the two initiatives), Amboli and Baripada from Maharashtra State of India were chosen for the field work. Data were collected and analyzed through a mix of qualitative (informal and semi-structured interviews, focus groups, interactive forest walks) and quantitative (a teacher-made rating scale to give ranking for the skills) methods. Local workshops were organized to seek participants' inputs in design, verification of interim findings and final sharing.

Though both initiatives emerged in different social-ecological contexts and used diverse strategies of self-organization and partnerships, they achieved human well-being (e.g. empowerment of local healers and women, improved agricultural production) and local biodiversity conservation goals. The most common and critical ingredient of these initiatives was the use of traditional medicinal plant knowledge (a type of traditional ecological knowledge) and the contributions of its holders.

One of the major concerns expressed by the communities is the erosion of traditional medicinal plant knowledge caused by poor transmission and declining importance placed on crucial skills by the young learners. The research demonstrated that transmission and sharing of local knowledge can improve community-based conservation. Innovative approaches such as biodiversity and recipe contests used in the study facilitated such

sharing in village schools and reinforced the importance of traditional medicinal plant knowledge and its holders in enhancing community-based conservation. The research indicates that community-based traditional medicinal knowledge needs continuous experimentation, strengthening and synergizing with formal environmental education to sustain and improve community-based conservation.

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Haash!! That is how we take a relief-taking breath marking an accomplishment of major work in Gujarati language. The doctoral thesis is one such major event with typically a long, solitary and often stressful journey but not so in my case. I have been fortunate enough to have a good mix of supportive, skillful and strenuous guides and friends at various stages of my thesis journey. Some walked and guided along throughout the journey; some joined and helped me whenever they are called and needed; and few appeared out of the blue to keep me walking on right path.

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DEDICATED TO
THE DEPARTED SOUL
OF
MY LOVELY AND CARING
MOTHER

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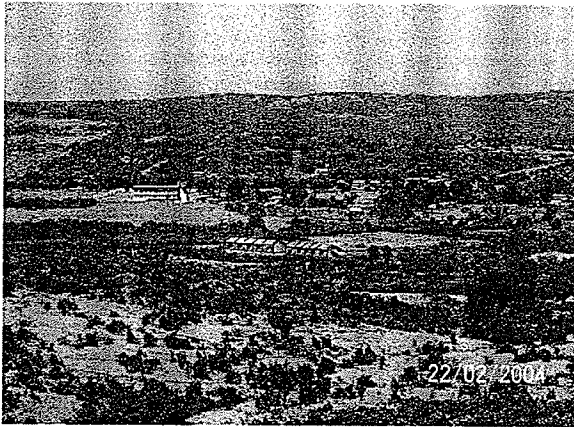
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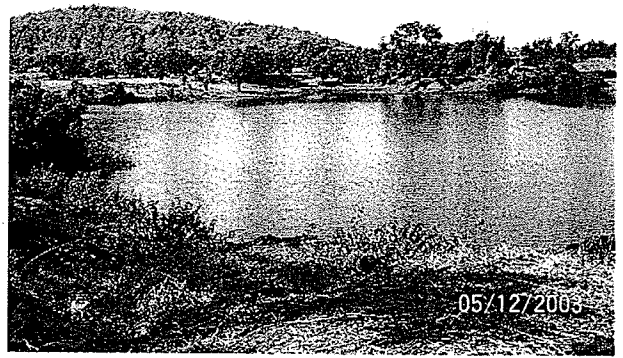
LIST OF ABBREVIATIONS

CAMP:	Conservation Assessments and Management Prioritization
CBC:	Community-based Conservation
CCBRM:	Center for Community-based Resources Management
DBTT:	Dorabji Tata Trust
DCF:	Deputy Conservator of Forest
EI:	Equator Initiative
EPA:	Environmental Protection Agency
FRLHT:	Foundation for Revitalization of Local Health Traditions
ICAE:	International Council for Adult Education
IDRC:	International Development Research Center
IFAD:	International Fund for Agricultural Development
IUCN:	International Union for the Conservation of Nature and Natural Resources
JFM:	Joint Forest Management
LEAP:	Learning for Environmental Action Program
MoEF:	Ministry of Environment and Forest, New Delhi, India
MPCA:	Medicinal Plant Conservation Area
NGOs:	Non-governmental Organizations
NRI:	Natural Resources Institute
RCMPCC:	Rural Commune's Medicinal Plant Conservation Center
RET:	Rare, Endangered and Threatened Species
SPSS:	Statistical Package for the Social Sciences
SRISTI:	Society for Research and Initiatives for Sustainable Technologies and Institutions
TEK:	Traditional Ecological Knowledge
TMK:	Traditional Medicinal Plant Knowledge
UNDP:	United Nations Development Programme
UNESCO:	United Nations Educational, Scientific and Cultural Organization

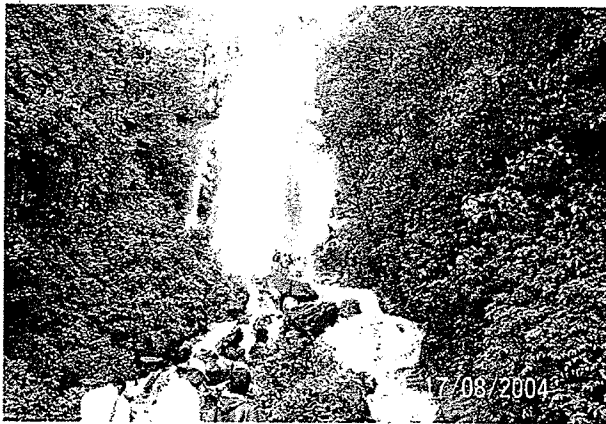
Chapter 1: INTRODUCTION



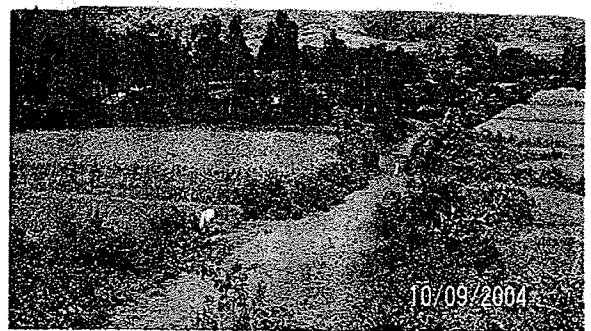
The bird's Eye view of Amboli



Community-based water conservation in Baripada



The famous waterfall of Amboli



The bird's eye view of Baripada

CHAPTER 1.0: INTRODUCTION TO THE STUDY

“Receiving international award for a small isolated and tribal village like ours is a matter of great pride. We also have high hopes of our younger generations to take forward the legacy of our collective conservation achievements. Our village youth though have limited opportunities of formal education, but can still have access to wisdom, spirit and knowledge of our great village elders. They also have a huge obligation to feed their families. Their struggle to meet the needs of their families, expectations of our village elders in continuing traditions and responsibilities as future custodians of conservation is a real and huge challenge. I wish I can create a cadre of about 100 village youths, who can take up this challenge and fulfill our collective dreams” (Chaitram, community leader, Baripada, November, 2003).

1.1: Research problem

The challenges noted by Chaitram are daunting and complex. His concerns about balancing and sustaining local conservation efforts, learning from village elders and meeting basic survival needs are immediate and multifaceted, as echoed by many conservation scholars. The loss of biodiversity and associated knowledge systems is a serious concern not just to those directly impacted but also to those with an interest in conservation and development (Gadgil et al., 2000; Koziell, 2001). These concerns are most serious and challenging in the economically poor regions where livelihoods often are dependent on the use of local biodiversity (Gupta, 1999). Some argue that the challenge of sustaining local biodiversity and associated knowledge systems calls for context-specific, local and innovative solutions that can achieve the dual goals of biodiversity conservation and poverty reduction. This is consistent with the neo-populist (Blaike, Brown, Dixon, Sillitoe, Stocking & Tang, 1997) trends in conservation and resources management that include the recognition and participation of local communities and the building on their knowledge systems and institutions.

Community-based conservation is an aspect of this ‘new conservation’ (Hulme & Murphree, 1999), which has been promoted recently because of its wider focus and applicability in terms of biodiversity conservation and poverty reduction. Community-based conservation is usually includes conservation efforts by and for communities in

order to conserve biodiversity and reduction of poverty (Berkes, 2004; Kothari, Pathak & Vania, 2000; UNDP, 2004). The communities assume a greater role and greater responsibilities than conventional approaches to conservation, as discussed later (see Section 2.1, Chapter 2). In this research, local communities are defined as 'communities of interest' (Hillery, 1955) and mostly include but are not restricted to local residents who live and work in villages, have common ties with or interest in village environmental issues, and engage in social interaction through common village development activities.

The research literature chronicling the practical experiences of community-based conservation initiatives from several parts of the world suggests that two key outcomes of biodiversity conservation and poverty reduction have not been achieved equally and simultaneously (Hackel, 1999; Kellert, Mehta, Ebbin & Lichenfeld, 2000; Kothari et al., 2000) due to a variety of social, political, economic and ecological factors. Scholars like Berkes (2004) therefore have reiterated the need for, and importance of, understanding conditions under which such community-based conservation initiatives have emerged and worked. This research examines two such conditions: self organization and cross-scale linkages as contextual conditions for learning and knowledge exchange in two community-based conservation initiatives. As described later, both of these conditions stem from a literature on complex systems thinking (Gunderson & Holling, 2002; Levin, 1998) in natural resources management.

While there is a growing recognition of the role of local knowledge systems, such as traditional ecological knowledge (Berkes, 1999), in improving community-based conservation (Goldman, 2003; Kellert et al., 2000), there is very little information on how local knowledge is acquired by communities and individuals, who are actively involved in community-based conservation. A limited number of anthropological studies on transmission of traditional ecological knowledge provide useful insights about the coping and adaptive capacities of subsistence communities (Ohmagari & Berkes, 1997; Ruddle & Chesterfield, 1977). The transmission of local knowledge and its potential role in attaining community-based conservation outcomes, however, has not been fully examined. This research looks at transmission of traditional medicinal plant knowledge

as a subset of local knowledge in two study communities and assesses its contribution to improving the outcomes of community-based conservation. Such an effort is also consistent with the learning approach to community-based natural resources management (Keen & Mahanty, 2006).

However desirable bringing together various forms of knowledge to improve the performance of community-based conservation is, it is not easily achieved. Some conservation scholars consider such a fusion or integration of knowledge as a major challenge to achieving successful community-based conservation (Brown, 2003). While the role of environmental education as a tool in strengthening community-based conservation initiatives is acknowledged (Hackel, 1999; Pagiola, Kellenberg, Vidaeus & Srivastava, 1998), the field of environmental education has largely ignored local knowledge systems. Palmer (1998) underscored this in her detailed review of policies and programs of environmental education in several countries. She concluded that most environmental education policies and programs tend to neglect the local concerns and powerful learning experiences encountered in daily lives that children bring to classrooms. She suggested that in order for environmental education to be successful, this prior learning and knowledge should be recognized.

The approaches to community-based environmental education (Andrews, Stevens & Wise, 2002; Environmental Protection Agency [EPA], 2000) can partly address this challenge by drawing upon the principles and practices of socially-critical environmental education (Fien, 1993; Robottom & Hart, 1994) and adult environmental education (Clover & Tan, 2004). Community-based environmental education approaches underscore the importance of collaborative learning and the use of multiple forms of knowledge in solving local environmental issues or problems. As discussed later, the practical experiences of community-based environmental education, though scattered, have been positive in terms of generating collaborative learning among schools, communities, government agencies and non-governmental organizations (NGOs). It seems reasonable that learning from community-based environmental education could improve the outcomes of community-based conservation, if the role of local knowledge

systems is explicitly acknowledged and if synergistic interaction between formal (school-based) learning of environmental education and informal local knowledge is encouraged. Two such environmental education approaches, biodiversity and recipe contests, were conducted in study communities. The result of these two approaches and their potential roles in promoting outcomes of community-based conservation are examined in this research.

1.2: Purpose and objectives

The purpose of this study is to examine the interrelationships among community-based conservation, local knowledge and environmental education. The specific research objectives are:

- i) To investigate and explain the role of self organization and cross-scale linkages in community-based conservation initiatives;
- ii) To describe learning through local knowledge systems by examining the role and transmission of traditional medicinal plant knowledge in community-based conservation;
- iii) To assess the role of environmental education approaches in the generation and transmission of local knowledge for community-based conservation.

1.3: Overview of the research methods

Under the philosophical orientation of pragmatism, an across-stage mixed-model design, where qualitative and quantitative methods are combined across three stages of objectives formulation, data collection and data analysis (Johnson & Onwuegbuzie, 2004) is used in this research. The pragmatist approach suggests that the nature of research questions should drive the selection of research methods (Cohen, Manion & Morrison, 2000). The across-stage mixed model followed in this research consists of qualitative objectives, qualitative data collection with both qualitative and quantitative data analysis.

As part of the field research, a cross-site¹ case study of two communities engaged in community-based conservation in western India was conducted. The two communities were identified on the basis of criteria such as, international recognition as successful community-based conservation initiatives and consultation with local environmental non-governmental organizations as described in Section 3.3, Chapter 3. The field research was participatory, interactive and adaptive (Nelson, 1991) in which suitable changes were made in research sub-questions, time of data collection and data collection methods, as established through working with research participants. A variety of qualitative data collection tools such as interviews (semi-structured and informal or conversation-type) and focus group discussions, as well as participatory tools, such as community workshops, interactive forest walks, biodiversity contests and recipe contests, were used in data collection. The data obtained through interviews and group discussions were recorded in field journals, with some of them being audio recorded, where feasible. These methods were complemented through participant observation by the researcher. Verbal and written informed consents in local dialects were obtained as mandated by the ethical guidelines of the University of Manitoba.

The data collected in this study mostly were qualitative in nature but were analyzed through both qualitative and quantitative procedures. The qualitative data analysis techniques, such as open and axial coding and categorization (Strauss & Corbin, 1990), were used to generate patterns and categories, which were then supplemented by actual statements of the respondents. The quantitative analysis (such as categorization of skill sets for traditional ecological knowledge transmission, frequency distribution of variables) was handled through Excel and SPSS (V 13.1) software. The preliminary research findings were shared through local language workshops (in both villages) and a Marathi language booklet in Amboli. The CD capturing various field activities was distributed among village committees and schools.

¹ Cross-site here refers to two or more than two different locations, which can be distinguished or compared on given criteria.

1.4: Organization of the thesis

This thesis is organized into seven chapters. Following this introduction, the second chapter is devoted to a review of literature on three major and interrelated concepts: i) community-based conservation; ii) traditional ecological knowledge; and, iii) environmental education. Literature on specific sub-themes relevant to the research objectives within these three broad conceptual areas including self-organization, cross-scale linkages (community-based conservation), transmission (traditional ecological knowledge) and community-based, adult and social-critical environmental education (environmental education) is also included in Chapter 2. The third chapter provides details on the various research methods, selection of field sites and a narrative on how the various challenges encountered were addressed in the field. The fourth chapter describes the results from the analysis of self-organization and cross-scale linkages in the two community-based conservation initiatives. This sets the context for next two chapters with the fifth chapter considering learning within local knowledge by examining transmission of traditional medicinal plant knowledge through crucial skills, sources, methods and reasons for its loss. Chapter 6 illustrates biodiversity contests and recipe contests as innovative community-based environmental education approaches and considers their outcomes in strengthening community-based conservation. Conclusions, limitations and key contributions of the research are outlined in the seventh and final chapter.

CHAPTER 2.0: COMMUNITY-BASED CONSERVATION, LOCAL KNOWLEDGE AND ENVIRONMENTAL EDUCATION: A REVIEW

Divided into five sub-sections, this chapter lays the conceptual foundation for the research based on a critical review of the relevant literature. The first section briefly reviews the contesting and emerging perspectives in people-centered approaches to biodiversity conservation and discusses community-based conservation (CBC). The second section discusses the concept of traditional ecological knowledge (hereafter referred to as TEK), as a sub-set of local knowledge systems and its transmission in relation to CBC. The third section reviews learning and educational implications of three environmental education paradigms with a socio-cultural focus and briefly discusses community-based, socially critical, and adult environmental education as three interrelated approaches to community-based conservation. The fourth section outlines challenges of achieving the CBC goals while combining formal environmental education and local knowledge. It also examines the customs and approaches that forge synergistic linkages between formal school-based environmental education and local knowledge systems to improve CBC. While providing an overview of the broad theoretical perspectives and practical examples of linkages between formal environmental education and local knowledge systems, both Sections 2 and 3 set the stage for learning in and for CBC -- the major conceptual thread that this research has considered.

2.1: Community-based conservation: Balancing conservation and development

2.1.1: 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 a key 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, Benjamisen, Brown, & Svarstad, 2001). The neo-liberal approach also forms part of the 'new conservation' dialogue (Hulme & Murphree, 1999), which advocates for peoples' participation in conservation through market-based approaches. However, the neo-liberal approach or new conservation has been criticized by some scholars on two 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 instance 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 intellectual property rights² 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 (Brown, 2002; Gupta, 1998). As a result, purely economic incentives are viewed as 'too narrow', 'too simplistic' and 'potentially counter-productive' (Berkes, 2004).

In many ways, the neo-populist paradigm confronts and rejects modern technological and scientific assumptions of development and thus becomes 'new style of postmodern thinking' (Blaike, 2000, p. 1045). Two distinct elements of such post-modern thinking of neo-populist paradigm were dominant in the literature: i) the importance of local technical knowledge particularly learning from farmers as exemplified in the farming system research (Okali, Sumberg, & Farrington, 1994); and ii) use of participatory research, learning and advocacy approaches (Chambers, 1993; Scoones & Thompson, 1994) in the field of environment, health, education, and welfare by many development agencies and non-governmental organizations (NGOs) in developing countries.

The practical applications of this thinking can be seen partly in the integrated conservation and development program (ICDP) of the 1980's, wildlife use approaches of

² The monetary forms of incentives both at individual and community level are being handled internationally in the form of intellectual property rights by the World Intellectual Property Organizations as suggested by the Article 8(J) of the Convention of Biological Diversity (Please see Gupta, 1998).

the 1990's and CBC initiatives more recently. Both ICDP and wildlife use approaches have been mainly intended to augment the conservation and development of protected areas and biodiversity within these areas (Brown, 2002). CBC has some 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. Finally, it emphasizes community's own knowledge and their participation in decision-making and sharing of power.

These features of CBC reinforce and widen the scope of the neo-populist approach both in conservation and development and establish its prevalence over the other approaches in contemporary discourse on conservation. The CBC initiatives, particularly the successful ones, can provide useful insights and lessons for learning to contemporary conservation discourse and practices. The learning potential of CBC approaches have been emphasized and explained by some scholars. For instance, Keen and Mahanty (2006) suggested and applied a learning framework for designing and evaluating the learning based on two successful community-based natural resources management initiatives³ in the Pacific region. This framework draws upon various learning principles, processes and theories including adult and social learning to strengthen collaborative natural resources management. In addition, the framework includes three core components: i) system thinking: learning from interactions between human and biophysical systems, which entails understanding of the perceived boundaries of the system, flows of resources and an assessment of drivers and hurdles to change; ii) negotiations: learning from each other through dialogue, conflict management and building bridges among various stakeholders; and iii) reflection: learning from reflecting on actions, values and beliefs. Such a learning approach however requires the use of multiple forms of knowledge and shifts from conventional reliance on only formal forms of knowledge (Jiggins & Rolling, 2002).

³ While I am aware of the use of various terms denoting people-centred approaches to conservation such as community-based wildlife management (CWM), community-based natural resources management (CBNRM) and community-based conservation (CBC), I prefer to use CBC which is broader in its conservation and development focus.

For the reasons outlined, the research applies the neo-populist tradition in understanding and improving CBC through a learning approach that focuses on: i) learning from the tools and interactive processes used by community-based organization and NGOs in achieving the local conservation goals; and ii) learning from local knowledge of communities.

This learning approach corresponds broadly to the research and learning program of Equator Initiative of United Nations Development Programme (UNDP). The Equator Initiative aims to achieve the poverty reduction through conservation and sustainable use of biodiversity in the equatorial region by fostering, supporting and strengthening community partnerships (UNDP, 2004). To meet these aims, the Equator Initiative identifies, recognizes and rewards (through prizes) outstanding CBC initiatives through nominations from various countries in the equatorial region. More than 400 CBC initiatives have been nominated so far and nearly forty of them were honored with prizes through competitions in 2002 and 2004. The research and learning program aims to develop scholarly understanding of the conditions of success of these CBC initiatives from the list of Equator Prize winners and nominees in order to inform policy and development priorities and encourage grassroots efforts that promote CBC initiatives in developing countries.

The next section deals with the first strand of learning that generates from iterative and interactive processes or partnership among the key actors (individuals and institutions) involved in community-based natural resources management. The most common form of partnership in CBC is among local NGOs, community-initiated institutions and government agencies (Lele, 1996). These partnerships are instrumental in the genesis, development and sustenance of many CBC initiatives (Berkes & Seixas, 2004; Kothari et al., 2000; Seixas et al., 2006). One of the ways to understand and examine learning within and from these partnerships is to use complex system thinking (Levin, 1998; Gunderson & Holling, 2002). Self-organization and cross-scale linkages are two such complex system thinking perspectives used in this research that set the context for learning and

knowledge exchange in community-based organizations and their partnerships in generating successful CBC outcomes.

2.1.2: Self organization and cross-scale linkage in community-based conservation

CBC is a complex, adaptive system of human and nature in which complexity emerged from few critical processes which create and maintain the self-organizing properties of the system (Resilience Alliance, 2006). The self-organization aspect is the one of the key evolutionary characteristics of all living systems and is widely applied to describe and understand the sustainability of the complex and linked social-ecological systems like community-based conservation. Self organization is implied in how unified the system is particularly in times of changes or surprises. Levin (1998, p. 12) aptly suggested, “The specifics are in the often simple rules that govern how the system changes in response to past and present conditions, rather than in some goal-seeking behaviour”. The differential capacities of such complex systems to self-organize may contribute to the diversity of CBC institutions that exist in different ecological locations (Gunderson & Holling, 2002; Levin, 1998). The understanding of self-organization therefore, can provide a useful account of how CBC initiatives evolved, survived or failed. The importance of and need for understanding the genesis or self-organization is also echoed in community-based wildlife management initiatives in South Asia. While these cases were studied to assess their performances in achieving desired goals in present, the idea on how these initiatives were organized in past has been least explored (Kothari et al., 2000).

Understanding self-organization of CBC initiatives can reveal: i) the genesis of the project in terms of motivation, trigger events and catalytic elements; ii) initial use of financial and human resources in organizing the project at the operational level; iii) development of capacities by key partners through various sources and types of knowledge; and iv) the role of leadership in the designing, organizing and implementing the initiative (Berkes & Seixas, 2004).

Various CBC initiatives have either self-evolved by local communities or were inspired by outsiders including government agencies, NGOs and international donor agencies.

Pathak, Choudhary & Bandekar (2005) examined the motivating factors responsible for the origin of self-evolved and externally-inspired CBC initiatives in India. The self-evolved initiatives in South Asia were motivated for a variety of reasons including influence of social or ecological movement in and around the area, a serious resource crunch, ecological hardship (e.g., reduced water availability), imminent pressure from industrial or commercial development, depleting biodiversity, religious and cultural values, and the result of a larger process of decentralized governance and empowerment. On the other hand, the externally-inspired CBC initiatives were enabled by programs such as larger internationally aided conservation projects, government policy or program (e.g. Joint Forest Management in India), revival of local tradition or neo-populist response for social justice, biodiversity conservation and/or resources availability crisis over a large area.

‘Trigger events’ are leading motives or events that drive communities to mobilize around an initiative, while catalytic elements help in boosting the initial organization and its sustenance (Seixas et al., 2006). The main trigger events that led to 27 CBC initiatives from the equatorial region (as recognized by Equator Initiative of UNDP) included: unsustainable resource extraction practices, legal and political conflicts, environmental disasters and deteriorating welfare conditions (Jonas, 2003). Analysis of 24 CBC cases, which were recognized by Equator Initiative in 2004, suggest that in many (even self-evolved initiatives) cases, local NGOs or government agencies served as catalysts by providing capacity building support in negotiating with other stakeholders and improving access to market and policies (Seixas et al., 2005). In many cases, a sequence of collaborative workshops or meetings between local communities and supporting partners was considered critical in initial self-organization. Local leadership also worked as a catalyst by enlisting opportunities for networking and partnership with other resourceful agencies to develop the CBC and management of wetland in Sweden (Olsson et al., 2004). In Brazil, an example of CBC related to oyster fishing revealed that, the local co-operative’s incremental knowledge gained through working on oyster aquaculture projects for more than three decades helped in self-organization. It has also been shown that in many examples of CBC initiatives pre-existing relationships between key

stakeholders were mobilized (Berkes & Seixas, 2004). Local communities, community leaders, NGOs, government agencies and international donors were the most common human resources and linkages among them (through planned workshops) and were the typical events for initial organization in many CBC initiatives.

Besides the use of human resources, financial resources were also required for self-organization, particularly to initiate activities (start-up funds) or keep the activities running (operational funds). While self-inspired CBC initiatives required no funding in the beginning, many of them required operational funding as they matured. Most external agency-driven CBC initiatives from the 2004 Equator Initiative finalists relied however on start-up and operational funding (Seixas et al., 2005). The sources of funding are multiple including international donors, government agencies and local funding NGOs. In CBC cases where external funding from international and national donors was sought, partnerships with individuals or organizations having past experience of resource mobilization was evident. The funds were used mainly to build and maintain infrastructure (Medeiros, 2004) for research and development such as conducting demographic surveys (Fernandes, 2004), and improving capacity through activities such as training on small business development skills (Maurice, 2004; Seixas et al., 2005). The in-kind contributions in terms of voluntary labour, transportation or time in self-organization has not been specifically acknowledged in research studies, but is still considered an important human resource in self-organization of CBC initiatives (Berkes & Seixas, 2004).

The building of capacity among key partners through accessing various sources of knowledge is critical to ensuring outcomes from CBC initiatives because of the consequent learning it requires (Seixas et al., 2005). The study of self-organization can provide useful accounts of learning by and from key individuals and institutions involved, in particular, CBC initiatives. Successful CBC should mobilize multiple forms and sources of knowledge (Brown, 2003) including local knowledge (Goldman, 2003) to generate what neo-populist conservation scholar Blaike and co-workers (1997) referred to as 'knowledge in action'. Recent studies show that successful CBC (Berkes & Seixas,

2004; Seixas et al., 2006) have created spaces and platforms for combining local knowledge with formal knowledge. The most common formal platforms are regular local consultations, meetings, workshops and training programs. In addition, innovative learning and sharing platforms were also used such as study circles in India (Kothari, Pathak & Vania, 2000), informal learning networks in Brazil (Medeiros, 2004), and adaptive co-management committees in Sweden and Canada (Kendrick, 2003; Olsson, Folke & Hahn, 2004). The relationship between local knowledge system and formal knowledge, as well as their contribution to local conservation is further discussed in Section 2.2.

The final category under self-organization of CBC initiatives is leadership. Leaders can drive the process of human and financial resource mobilization and enlist support from various individuals and organizations to help organize the CBC initiative in the beginning. Leaders may be an individual or a group of individuals from institutions (community members or representatives from local community groups, NGOs, government and donor agencies) or institutions themselves. Leaders often take on the role of brokers or catalysts for initial organization as identified in CBC initiatives in Brazil (Medeiros, 2004) and Thailand (Senyk, 2006). Further, Timmer (2004) highlighted five key roles of leaders in CBC initiatives: i) innovator; ii) communicator; iii) learner; iv) bridge builder; and v) system thinker. In some cases, these roles are assumed by more than one key individuals and institutions at various stages of CBC initiatives (Herrera, 2006). Interestingly, the CBC initiative from Brazil has demonstrated rotational leadership structure and roles, where the main coordinator of CBC initiative keep shuffling among the State Government Forest Foundation, a partner NGO and a State University Research Institute to take up different roles between 1990 to 2004 (Medeiros, 2004). The change in leadership in response to emergent needs was also evident in six other CBC initiatives recognized by Equator Initiative (Berkes & Seixas, 2004). Even though in many cases these leaders are reasonably well-trained in formal education, the representation of women in leadership positions was less evident.

2.1.3: Cross-scale linkages

CBC is an integrated social-ecological system (Berkes & Folke, 1998) in which two-way and mutual effects can be observed. The human institutions respond to ecological changes and in the same way, ecological processes are influenced by human interventions. These closely-linked relationships between humans and nature are embedded into a larger social-ecological system, which involves range of actors and processes at multiple scales (Anderies, Janssen & Ostrom, 2004).

Scale is another generic feature ascribed to complex systems. There are seven common scales with various levels that are critical in understanding human-nature interactions. These scale are: i) temporal (rates, duration and frequency of time such as daily, monthly, seasonal, annual etc); ii) geographical or spatial (across the space or physical boundaries such as patches, landscape, region and globe); iii) jurisdictional (administration such as local, provincial, national and inter-governmental), iv) institutional (rules such as operational, laws and constitutions); v) management (plans such as tasks, projects, strategies); vi) networks (links such as family, kin, society and inter-society); and viii) knowledge (realities such as specific and general) (Cash et al., 2006). Complex systems like CBC not only operate at the multiple levels and scales, but their actors at these levels generate multiple interactions. There are several kinds of institutional forms (such as multi-stakeholder bodies, citizen science or policy communities) and research approaches (such as ecosystem management, adaptive management) which facilitate and speed up the cross-scale linkages. Berkes (2002) concluded that cross-scale institutional linkages should be designed in a manner which facilitates self-organization in cycles of change and enhances learning.

The cross-scale view of CBC is critical (Cash & Moser, 2000) because cross-scale linkages could provide an opportunity through which different actors including institutions can bring their diverse values and knowledge into decision-making and management of a given natural resource. The responses of decision-making and management at one scale may not always work at another higher scale. For example, failure of Joint Forest Management initiatives in India was partly attributed to the

unwillingness of State Forest Department (at higher spatial and political scale) agencies to accept village communities as forest managers (Poffenberger & McGean, 1998). On the other hand, successful CBC initiatives from equatorial region (Seixas et al., 2006) and co-management mechanisms in Sweden and Canada (Olsson et al., 2004) demonstrate cross-scale linkages wherein management structures or institutions and ecological processes may run at multiple spatial, jurisdictional or temporal scales.

Berkes and Seixas (2004) examined cross-scale linkages among five CBC initiatives as part of the research and learning program of Equator Initiative of UNDP through analysis of: i) horizontal linkages among individuals and institutions across space or sectors; ii) vertical linkages among individuals and institutions across levels of organizations or sectors; and iii) examination of stronger and weaker linkages in generating various outcomes for organization and achievement of the goals of CBC initiatives. The other sub-categories of analysis in their study that overlap with sub-categories of self-organization included: mobilization of funding and other resources, capacity building and knowledge systems, and leadership. The knowledge of vertical and horizontal linkages among key actors and key enabling linkages among them should be focused in order to gain better understanding of cross-scale linkages. The vertical linkages become important in economically poor but ecologically rich regions of developing countries like India, where formal institutions and government support at all levels are generally weak (Barrett, Brandon, Gibson & Gjertsen, 2001; Gupta, 1999). Even where community-based institutions are relatively strong (horizontal scale) they may have to rely on formal institutions for legal and policy support if they want to be successful (Hooper, Jafry, Marolla & Phan, 2004).

The cross-scale linkages studied by Berkes and Seixas (2004) offer some useful insights about various outcomes such as funding, organization, capacity building, and knowledge systems as generated through these linkages at four to five major geographical or jurisdictional levels. This included: i) a local or community level; ii) a regional or district level; iii) a state or provincial level; iv) a national level; and v) an international or global level. The role of national governments in these initiatives towards actors at other levels

was neither direct nor significant, nevertheless their presence in the vertical linkage was acknowledged in most of these initiatives. There was one very strong horizontal linkage providing a central support (like a tandem in bicycle providing support to various spokes in a wheel) for each initiative at the local level. The tandem of support was provided by NGOs and/or district or state-level government agencies.

The experience with horizontal and vertical linkages involved in capacity-building was different in each case. For example, in Brazil's oyster cooperative, formal technical knowledge in terms of socio-economic viability of extractive reserves (protected areas allowing some resources use) came through collaborative research arrangements undertaken by two state level agencies, the University of Sao Paulo and support from national environmental agency. In another case in Guyana, however, such technical knowledge on survey methodology was drawn from a reserve in Brazil. Learning by demonstration or practice was mostly emphasized in the training both by actors at horizontal and vertical levels. The experience of the main organization in a particular initiative tends to result in the transfer of skills to other areas and activities with spin-off effects not anticipated at the start of the initiative. For instance, in Brazil, the organizational experience and skills manifest in creating cooperative institutions, which helped in establishing women's seamstress groups.

In particular, self-organization and cross-scale linkages can provide useful insights on learning about how CBC initiatives organize human and financial resources, build their capacities through mobilization of various knowledge, and leadership in achieving local conservation and human well-being. One of the characteristics of successful CBC initiatives is how effectively they use local knowledge in organizing and establishing cross-scale linkages. The learning from local knowledge as a second strand of learning approach is discussed in the next section.

2.2: Traditional ecological knowledge: Contribution and transmission in community-based conservation

The scholarly debate over the use, validity and political implications of TEK (Agarwal, 1995; Letsoko, 2003) continues to grow simultaneously with the literature establishing the importance of TEK in natural resources conservation (Berkes, 1999). In the successful examples of CBC initiatives, the role of TEK has also been acknowledged. Studies by several scholars (Berkes 1999; Berkes & Jolly 2001; Brown, Tompkins & Adger, 2002; Brown, 2003) have demonstrated that respecting community knowledge and sharing information are critical components of the empowerment process in community-based conservation. The use of local knowledge systems such as TEK constitutes one of the critical conditions leading to the success of CBC initiatives (Berkes, 2004). The changes or shocks (for example, natural calamities) provide opportunity to the local users or members of community to self-organize and learn by making use of local knowledge systems including TEK. There is an increasing recognition by conservation scholars that TEK can be more effective in addressing spatial and temporal heterogeneity and social-ecological complexities at the local level (Brown, 2002; Berkes & Jolly, 2001; Fairhead & Leach, 1996; Zimmerer, 2000).

The experiences with incorporating TEK in CBC initiatives, however, have been mixed as highlighted in the following examples : i) very little or ineffective use of TEK in CBC in Kenya and Nepal (Kellert et al., 2000) due to local communities being seen as 'subject of state' (Ribot, 1999, p. 43) and ignorant and therefore requiring formal training and supervision; ii) the token value of TEK in CBC in the name of participatory research, where local communities become tools for research rather than active contributors of knowledge in conservation (e.g., CBC initiatives in Africa studied by Ribot, 1999, and Goldman, 2003); iii) TEK used in CBC in extractive and one-way manner, where the formal or scientific knowledge was not shared with local communities (Kellert et al., 2000) or TEK was appropriated through private commercialization (e.g. using of para-taxonomists in bio-prospecting herbal drugs by a private pharmaceutical company [Merck] without sharing any economic benefit to para-taxonomists).

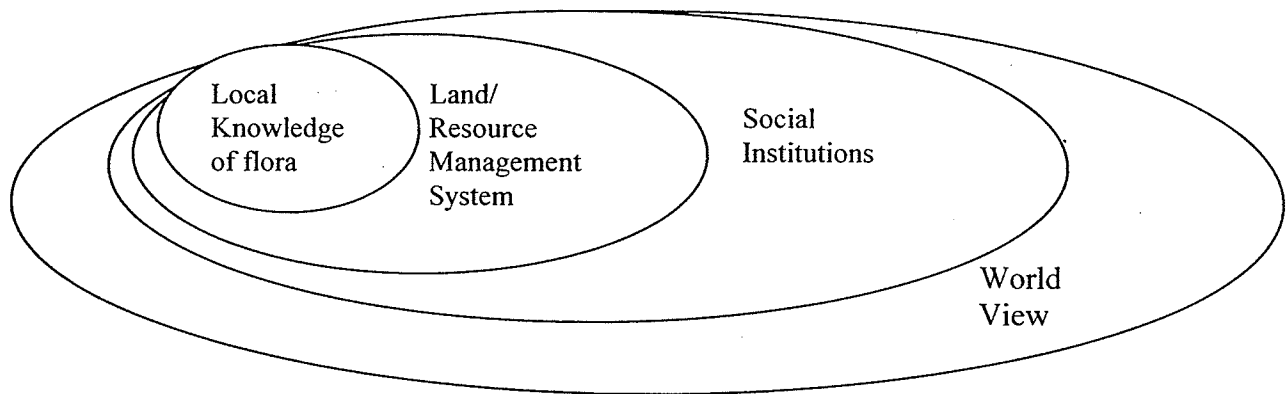
The real challenge in the use of TEK in CBC, therefore, is to form fusion knowledge (Brown, 2003) or 'knowledge in action' (Blaike et al., 1997) and innovative and flexible ways through which formal and local knowledge holders can mutually inform, interact and learn to achieve the goals of CBC. One of the crucial requirements to promote such fusion is to develop better understanding of the concept of TEK and its mechanisms of learning among TEK holders as described in the next two sub-sections.

2.2.1: Traditional ecological knowledge as a sub-set of local knowledge systems

More than three-quarters of the World's population relies on local knowledge systems to meet their medicinal needs and at least half rely on local plants and associated knowledge systems for food supplies (RAFI, 1995, as cited in Walsh, 2003, p. 12). 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, p. 8). TEK is also being considered to be 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 (Berkes, 1999; Grenier, 1998; Johannes, 1989; Ruddle, 1993). Berkes (2000) explores the role of TEK in managing processes and functions of complex social-ecological systems as parallel to adaptive management. He further suggests that TEK is largely dependent on social mechanisms, which seem hierarchical as depicted in the Figure 2.1:

Figure 2.1: Levels of analysis in traditional ecological knowledge



Source: Berkes, 1999

As depicted in Figure 2.1, TEK can be operational at four interrelated levels. The first level starts at the village/local level, which includes the knowledge of local plants and animals, their identifications, folk taxonomies, and uses (ethnobotany). This sort of knowledge is based largely on the long-term observations of a particular species or ecosystem. At the second level, TEK exists in the form of land or resources management systems, which are 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 (such as hunters, pastoralists or fishermen) having a common stake in and interdependence to use the resources. The final level 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 intermingle so tightly that they may appear the same. For example, it is 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 rely mutually on feedback and thereby generate learning, which helps them survive through adaptation in the event of change or crisis.

This scheme of TEK is also useful in understanding how natural resources are sustainably used by local communities. However, along with such a practical understanding of TEK

in sustainable management in a given society or community, the acquisition or transmission of TEK is equally and fundamentally important in understanding the socio-cultural aspects of any society.

2.2.2: Transmission of traditional ecological knowledge: An emerging and less-studied field

Ruddle (1993) clearly stated the importance of understanding transmission:

During knowledge transmission over several generations, social institutions are generally crystallized; routine or habitual ways of doing things gradually become the customary ways that things are done. For children, a community's customary ways eventually become the given-received social world, an analog of the biological-physical world with which it overlaps (Ruddle, 1993, p. 19).

The transmission of traditional knowledge thus helps in institutionalizing ways of use management of natural resources in the form of rules in use or conduct. In other words, understanding of transmission of traditional knowledge can provide useful insights on the process of socialization of children in their own communities and the nature of social and cultural learning that younger people encounter before they become a fully practicing elder or adult member of a given community. In their review and studies on transmission of knowledge, Battiste and Henderson (2000) comment that while earlier work on the subject has focused more on 'assimilation' (see for example studies by Johnston, 1988; Knockwood, 1992; Milloy, 1999) very few scholars have really tried to understand the transmission of indigenous knowledge within indigenous traditions. Ohmagari and Berkes (1997) reconfirm this observation, noting that the processes of transmission of indigenous knowledge has not been studied enough especially in relation to natural resources management and conservation.

The limited number of scattered studies concerning the intergenerational transmission of TEK has focused largely on two areas: a) structure and/or processes of TEK transmission, and, b) factors and changes affecting transmission.

2.2.2.1: Structure and process of transmission

Several studies highlight: i) modes (processes) and methods through which TEK is acquired between elders and younger generations; ii) location or sites where teaching-learning of TEK occurs; c) sources from which TEK is acquired; and iii) age at which various skills are acquired. Ruddle and Chesterfield (1977) summarized various studies on the transmission of traditional knowledge in the context of subsistence societies and suggested the general structure of transmission process as follows: i) the training of various economic activities is age-specific; ii) various tasks are taught systematically using similar methods; iii) the sequence for teaching particular task/skill complex is from simple to difficult; d) sex and age are important considerations in teaching of these tasks (e.g. in general, adults prefer to teach tasks to the learners of same sex); iv) tasks are location-specific and preferably taught at the sites at which they are to be used; v) a specific time interval is allocated for teaching different tasks; vi) tasks are generally taught through vertical mode (parents or teacher to student) than horizontal (siblings/non-family members to children); and vii) the mechanisms for incentives (rewards) and disincentives (punishments) are associated with learning of certain tasks or task complexes.

The pioneering study on the learning sequence for traditional food procurement techniques in the Orinoco Delta by Ruddle and Chesterfield (1977) provided an eight-step model of the learning, including : i) familiarization or identification of the skill to be learned; ii) observation of the elder/teacher performing the skill; iii) assistance to learner with simple steps; iv) helping the learner with the entire skill complex; v) supervision of the actual performance of the skill complex; vi) apprenticeship; vii) independent implementation of the skill complex by the apprenticeship to the instructor; and viii) working as a practitioner (equal partner) or peer to the teacher. However, this framework, according to some scholars, is very information-oriented and might pose a problem of 'informant fatigue' in local communities. Ohmagari and Berkes (1997), therefore, reduced this eight-stage model to a shorter learning framework while studying 93 bush skills among women of two sub-Arctic Cree communities in Canada. This revised model

has three main stages: i) skills learned by hands-on experience; ii) skills learned by observing only; iii) skills not learned at all. Chand and Shukla (2003) analyzed the transmission of traditional knowledge of medicinal plants among rural and tribal communities in western India and clearly identified three stage of apprenticeship which included: observation and imitation of practice and monitoring by mentor, which might be extended to requests for assistance in practice by elder healers.

Studies that examined the structure of transmission also highlighted the methods or modes of learning. The most common forms of transmission that were cited in various studies range from formal apprenticeship (see an example of small scale fishing societies by Cordell, 1989) to systematic individual and group interactions, wherein the process is informal but still sequential, additive and highly structured, as in the case of the fishing communities from Gulara Island, Venezuela (Ruddle, 1993). Ritchie and Ritchie (1979) in their case study in Polynesia observed that most local knowledge was transmitted during engagement in daily tasks like fishing. The transmission of verbal instructions were rare and both children and adults learned by observation followed by imitation. Formal instructions in this case were minimal and questioning by children was discouraged except as it pertains to concrete situations.

Ruddle (2000) observed that repetition of observation, listening, and learning through practice are principal factors in the transmission of knowledge in Pupukan communities. Battiste and Henderson (2000) also reported that cognitive transmission of indigenous knowledge is oral and intimate against distant and literate modes. The cultural mechanisms for transmission may include 'apprenticeship, ceremonies and practice' (Daes, Para 8, 1994). Chand and Shukla (2003), in studying the transmission of traditional medicinal plant knowledge established that different methods were used by elder healers for teaching different skills. For instance, to teach plant identification, verbal instruction and actual engagement in practice (to bring specific herbs/plants) were used, whereas guided observation was used to teach preparation of product and administration of treatment. In contrast to an earlier study by Ritchie (1979), questioning behaviour from students was encouraged by elder healers to ascertain feedback from

students while teaching specific skills such as plant identification and plant uses. Interestingly, the elder healers also developed and used educational kits to teach skills such as application of treatment and post-treatment follow-up. The teaching methods reported in various studies exhibited some similarity; they were altered by elder teachers according to nature of skill to be taught, cultural context, type of natural resource and purpose of teaching (e.g. subsistence or professional development).

The location or place in/through which intergenerational transmission of local knowledge occurred was also explicitly studied by few scholars, as part of the structure of transmission process. The 'land-ecology complex is a central and indispensable classroom' where transmission of culture and traditions within indigenous groups takes place (Daes, 1994, para 9). In a Cree community in Canada, children were expected to help adult family members in subsistence production in specially organized bush camps (Ohmagari & Berkes, 1997). Ruddle's (1993) study on Guara Island communities of Venezuela reported the cultivated field as the main site for learning food production, except for skills such as identification and early harvesting, which was taught in a backyard garden. The skills of animal husbandry were taught in open grasslands. The earlier training of fishing happened in river and cultivated fields which gradually moved to more risky back swamps and grassland as the apprentices develop their skills. Chand and Shukla (2003) in their study on transmission of traditional medicinal plant knowledge in India cited (specifically-designed interactive walks to) forests or farms and (practice of indigenous treatment at) home, as the two major sites used by local healers to teach their young students.

With respect to the sources of learning, the transmission literature refers to both vertical (parent/family elder to children) and horizontal – including community elders or local experts to child (Hewlett & Cavalli-Sforza, 1986; Ladio & Lozada, 2001; Ohmagari & Berkes, 1997) as well as spiritual sources. While reviewing studies related to transmission among healers in Africa, Vanderbroek, Van Damme, VanPuyvelde, Arrazola, & DeKimpe (2004) indicated the use of a variety of sources in the transmission of traditional medicinal plant knowledge. These sources included a group of relatives (in

Cameroon), family members, ancestral spirits, other healers (in Zambia and Tanzania) and divine call through dreams or traumatic illness (in Malawi). The Yucate Maya communities of Latin America also used the same sources (experienced healers, relatives and dreams) (Ankli et al., 1999). The most common sources in vertical transmission included either mother or father or both parents, grandparents and husbands (Ohmagari & Berkes, 1997). In contrast, the recent studies by Zarger (2000) raises importance of horizontal channels (such as siblings and peers) in acquiring traditional knowledge in a subsistence-based Maya community of Belize. Both vertical and horizontal sources were used in local knowledge transmission; however, the later seems to be more important in recent time.

The local knowledge-based skills are generally acquired concurrently with learning of local dialect or language, usually by ages 12-14. For example, Zarger (2000) showed that among Q'eqchi' Maya of Belize, the food resources and other subsistence skills were acquired between ages 4-14. A similar age range (2-14) was reported on Guara Island, Venezuela, in a study by Ruddle (1993), where during initial period children acquired familiarity of food items used at their homes, and then gradually learned more demanding tasks (such as fishing in a risky marshland) as part of their subsistence skills. An age range of 13-15 years was reported as a key period for mastery of most of the bush skills among Cree communities in Canada (Ohmagari & Berkes, 1997). The Cree children were exposed to learning about survival skills including hunting at the age of five to seven years. By the age of nine, many of them were ready to advance well into their learning careers. Learning about traditional medicinal plant knowledge among tribal communities in Gujarat State of India could start as early as five to seven years of age and by the age of nine, most of the learners are well placed in the learning cycle, which might continue for several years (Chand & Shukla, 2003).

2.2.2.2: Factors affecting transmission

The factors affecting the process of transmission have included: i) direct (personal characteristics of transmitters (teachers) and receivers (students); and ii) indirect (outside institutions and policies that influence on process of transmission). A number of socio-

economic, cultural, ecological, and historical factors are considered important in transmission of traditional knowledge (Wyndham, 2000). However, assessing their impact is difficult, since their individual and combined effects may vary in different community contexts (Zarger, 2000).

Studies on various factors are either general in nature (highlighting a range of possible factors affecting transmission process) or specific (examining specific factors in detail). In the former category, the general concerns over a loss of transmission or erosion was expressed. For instance, work of international NGOs like Foundation for Revitalization of Local Health Traditions (FRLHT) in India suggests that the old age of healers coupled with disinterest among younger children in learning about traditional medicinal plant knowledge, reduction of sites of learning (forests), negative attitudes of formally-trained educators and governments towards local knowledge systems and their practitioners, and a lack of policy-level and institutional support are major factors contributing to loss of local health traditions (Balasubramaniam, 2000).

Studies of specific factors affecting transmission elsewhere demonstrate the same concerns. For instance, Ohmagari and Berkes (1997) analyzed the local social context affecting the transmission among the Cree communities in Canada and highlighted four barriers in transmission: i) changes in the local learning environment that may or may not have been imposed by formal education policy (residential schools); ii) lack of adequate time availability in bush (sites of learning) due to migration of children (to attend schooling far away from their residence) and increased engagement of adult community members in outside cash-driven economic activities; iii) learning skills at the later ages (delayed transmission); and, d) modern technological and social changes (such as TV, schooling and sedentary life style) leading to adverse changes in values (induced materialistic values; disrespect towards indigenous ways of life). Vanderbroek and co-workers (2004) concluded that social factors such as the presence of extended family members who practice traditional healing is an important determinant for the successful transmission of traditional medicinal plant knowledge from healers to students in the Bolivian Andes and Amazon. Most of these studies examining the role of specific factors

affecting TMK transmission thus acknowledged local level social and educational aspects as the key players. Despite the educational, social and ecological significance, comprehensive studies on the process of transmission are limited. Berkes (1999, p. 141) laments 'the field of formal education is largely silent' about understanding on learning mechanisms and recognition of TEK.

The challenge of achieving CBC goals through 'knowledge in action' demands critical construction of knowledge by integrating informal (local) and formal knowledge (Blaike et al., 1997; Brown, 2003). The partnerships among various knowledge holders including TEK is a critical requirement for success of CBC, given the fact that two main goals of CBC-- biodiversity conservation and human well-being-- are not always achieved equally (Berkes, 2004). Kellert and co-workers (2000) evaluated CBC initiatives in Nepal, Kenya, and USA and found that human development goals like equity and empowerment are achieved more frequently than biodiversity conservation goals. In the study of CBC for the rural African wildlife protection, simultaneous achievement of human well being and conservation goals were also found too complex and difficult (Hackel, 1999).

2.3: Environmental education: A component of and tool for community-based conservation

One of the ways to improve the achievement of both CBC goals is to use educational tools and approaches, which are locally accessible and widely acceptable. Environmental education has been suggested as one such useful tool (Hackel, 1999), which can improve the local acceptability of CBC programs designed by NGOs and government agencies (Pagiola et al., 1998). The learning potential of formal knowledge systems such as environmental education in relation to CBC has recently been recognized, particularly when evaluating the outcomes of CBC. The effective implementation of CBC initiatives at various levels can be facilitated through institution building efforts such as environmental education (Kellert et al., 2000). The case studies on CBC initiatives on wildlife management from South Asia also acknowledged that practical experiences and lessons from CBC in the region hold great learning potential if supported through

environmental education in both formal and informal institutions (Kothari et al., 2000). Corresponding to this CBC literature, which considered environmental education as a tool within CBC, there is also a growing body of environmental education literature that highlights environmental education approaches for CBC.

2.3.1: Learning visions of social cultural paradigms of environmental education

The recent debate about educational ‘paradigms’⁴ or approaches in environment education is dominated by a socio-cultural focus (Sauvé, 1996; Palmer, 1998). Bertrand and Valois (1992) have suggested three major paradigms of environmental education: the rational paradigm; the humanistic paradigm; and, the inventive paradigm (Sauvé, 1996, p. 12). These paradigms offer different visions of learning and educational choices in the discourse and practices of environmental education. For instance, the rational paradigm views nature to be dominated by human society and emphasizes the use of pre-structured and expert-driven learning as happening mostly in the case of transmission of formal knowledge in the classrooms. The humanistic paradigm puts weight on optimal personal accomplishment and learner-centered educational strategies. The inventive paradigm is an emerging and radical approach that calls for critical construction of knowledge and concrete actions at the local level through co-operative learning. In the context of the differential educational visions offered by these three major educational paradigms, their features are compared in the following table.

⁴ By paradigm, I mean a model or school of thought which is widely accepted for its powerful idea or authoritative theoretical explanation (Blaike et al., 1997). For further discussion on paradigms, please see Chapter 3.

Table 2.1: Educational paradigms in environmental education

Educational Paradigm	Associated socio-cultural paradigm	Main features	Examples of environmental educational approaches
Rational	Industrial: dominating nature, competition for growth and productivity	Transmission of formal scientific /technological knowledge, emphasize on rote learning and memorization	Formal presentation or demonstrations, modular training approach
Humanistic	Existential: respect for nature, harmony and self-accomplishment	Focus is on learning and learner, developing multi-faceted personality of persons through freedom to learn	Nature education or value education
Inventive	Symbiosynergistic: symbiotic relationships among humans, society and nature	Critical construction of knowledge for social transformation. Cooperative and collaborative problem solving	Environmental education at grassroots, socially critical environment education

Source: Sauvé (1996)

The inventive educational paradigm fits best with neo-populist tradition and community-based conservation. The inventive approach focuses on the symbiotic relationship between humans, society and nature, and establishes its prevalence over the other two approaches. It appreciates the value of different systems of knowledge including local knowledge systems, in critical construction of knowledge. Also, it relies on collaborative learning, which offers a wide spectrum of choices for collective decision-making and problem-solving for a given environmental issue. A focus on community-based and local environmental issues is also congruent with the education *for* environment (Fien, 1993).

The education *for* the environment approach has been debated by environmental education scholars since early 1980s-- the time at which the systematic understanding of the environmental education processes in formal education began. Lucas (1980) portrayed three dimensions to describe environmental education processes in schools:

i) Education *about* the environment which aims at imparting skills to develop cognitive understanding about environment. This focus matches well with the rational paradigm; ii) Education *in* or *from* the environment, where environment is used as a learning resource (such as outdoor environmental education programs) or technique of instruction. This vision echoes the learning processes envisaged by humanistic paradigm; and, iii) Education *for* the environment which focuses on preserving or improving the environment for specific problem-solving or purposes as envisioned in inventive paradigm. The 'pedagogic rhetoric' (Malone, 1996) of such categorization of environmental education processes in formal schools in general and education for environment in particular contributed to the genesis of critical theory for environmental education.

2.3.2: *Socially critical approaches to environmental education: Learning 'for' environmental education*

Fien (1993) proposed critical theory for environmental education after an in-depth review of literature on critical practice in environmental education. The five interconnected and core principles of critical education for the environment are:

- i) *Development of critical environmental consciousness*: through 'an understanding the central beliefs of eco-socialists environmentalism' (Fien, 1993, p. 60). In short, environmental education is socially and politically constructed and the root causes for environmental problems lie in dominant and powerful economic processes and institutions and larger societal structures that perpetuate and often impose oppressive ideologies and processes. The solutions of environmental problems therefore should be evolved democratically to counteract these dominant ideologies and unequal distribution of economic resources.
- ii) *Development of critical thinking and problem solving skills*: Critical problem solving skills entail both the subjective views (equates with value-based research as prescribed in humanistic paradigm) and objective views (equates with fact-based research as in rationale paradigm). It should also generate a sense of emancipation, where students challenge the dominant ideologies and processes and engage in self-reflection and revelation of different values.

- iii) *Development of environmental ethics*: This is closely in tune with development of multi-faceted personality of the learner as advocated by liberal or humanistic approaches. Students would learn about a range of complementary and conflicting values associated with different solutions and position themselves in this complex mix of values, by offering their self-reflected and self-critiqued solution.
- iv) *Development of political literacy*: Political literacy bestows students with knowledge, skills and commitments so that their actions can be better informed and active in the existing school or society as political systems of power and decision-making.
- v) *Critical praxis*: This Freirian approach suggests integration of reflection and action. Students are actively engaged in developing consciousness about existing oppressive ideologies and processes, which will empower them to engage in reflective action or *praxis* to achieve social transformation. The teaching strategies are in complete harmony with its goals.

Out of these five features, three (ii, iv and v) reflect the characteristics of a socially critical approach to environmental education (Fien, 1993; Robottom & Hart, 1993). Palmer (1998), based on earlier works of Fien (1993) and Robottom & Hart (1993) suggested that research and practice of socially-critical approach to environmental education should have the following characteristics:

1. Involvement of students, teachers and community agencies in collaborative investigations of the real environmental issues in their local area;
2. Schools working together with communities to develop a new critical awareness of the roles that communities play in influencing the course of such issues;
3. Environmental education research and practices that make explicit the values and interests of various groups;
4. Environmental education research and practices which are driven more by the nature of the unfolding of the issue than by prior commitment to teaching a body of knowledge/skills.

These features of a socially critical environmental approach to environmental education were further consolidated as a set of principles by various scholars (Robottom & Kyburz-Graber, 2000) to analyze professional development in international environmental education projects. The principles are: i) *contextual*: environmental education should be sensitive to context; ii) *responsive*: environmental education should address issues which are of interest/concern or relevant to participants; iii) *emergent*: environmental education takes into account the iterative process of outcomes; iv) *participatory*: environmental education should ensure direct and equitable involvement of all participants; v) *critical*: environmental education should help reveal and evaluate interest, values and assumptions of the participants to inform and justify a given program/activity/practice/policy; and, vi) *praxiological*: Environmental education should be mediated by *praxis*-- which helps in reflective interaction of theory and practice in a given setting. According to some scholars (Huckle, 1983 and Stevenson, 1987 as quoted in Palmer, 1998, p. 93) socially critical approaches to environmental education are the 'radical reform' approaches to environment improvement, which views the environmental crisis as a larger problem of society.

While the need for research using socially critical approach to environmental education was strongly advocated by scholars in early 1990s, its practical limitations can not be overlooked. One of the important limitations of the socially critical approach to environmental education is that it has been primarily theoretical. For instance, the earlier works of Robottom & Hart (1993) as well as by Fien (1993), mainly centered on teaching and learning processes within the formal schooling. Its research-based application has been largely confined to review formal schooling practices including curriculum (see for example, study by Sammel, 2001). Research studies that apply the lenses of socially critical approaches to environmental education in the fields of non-formal or informal environmental education (e.g. community's real local environmental issues) are very few. In her critique on socially critical approach to environmental education, Walker (1997) challenged the application of socially critical theory in environmental education due to its impracticality in bringing about change in existing school practices, and its inability to explain the contribution of learning in bringing about educational change fully. She

concludes, 'For many practitioners, socially critical theory not only fails to give them an implementation theory, it *de facto* denies their own practical knowledge' (Walker, 1997, p. 5). This gap is also seen in the Robottom and Hart's proposed model of socially critical environmental education, where the role of the community's own knowledge has not been emphasized clearly. Following this suit, the role of local knowledge systems such as TEK does not figure out explicitly in the three main characteristic features of socially critical environmental education.

On the other hand, international agencies such as UNESCO in Chapter 36 of Agenda 21, however, emphasize the need for incorporating local knowledge systems into formal, informal and non-formal modes⁵ of environmental learning in schools (Reid et al, 2002). Environmental education can not be confined to improvement in the knowledge, skills and attitudes of young children in schools but extends to the design and implementation of learning strategies for local communities and schools (Dillon & Teamey, 2002; Sterling, 2001). Responses to this call are echoed in the field of adult environmental education, where community-based education has emerged as a strong tradition, as described in the next section.

2.3.3: Community-based approaches to adult environmental education

Valuing experience-based learning and local knowledge of learners is the implicit focus of adult environmental education, as opposed to government-sponsored and managed non-formal adult education programs for improving adult literacy skills (Hall, 1992). Expanding on the Freirian view of popular education as 'research by the people for the people', institutions like the International Council for Adult Education (ICAE, 1992) came into being. ICAE institutionalized a dedicated network to community-based

⁵ Formal education is usually characterized as a progressive ladder of structured education taking place usually in classrooms/colleges, with sophisticated and time-bound evaluation. Non-formal education programs are semi-structured and targeted at particular groups of people and are usually designed to impart skills, with or without structured evaluation. Adult literacy education would be an example.

education called the Participatory Research Network which provided an alternative approach to community-based education programs. This approach to community-based environmental education is influenced by socially critical and participatory research and 'has been characterized by processes than endeavor to support social change by addressing community-identified problems' (Malone, 1996, p. 50). This is exemplified in Learning for Environmental Action Program (LEAP) developed by the International Council for Adult Education (ICAE, 1992).

The LEAP initiative has created a global discussion forum which influenced in defining and implementing environmental adult education. One of the significant outcomes of the LEAP was the first treaty on environmental adult education known as 'environmental education for sustainable societies and global responsibility' (Clover & Tan, 2004). LEAP responded to UNESCO's call of integrating formal and informal learning in adult education by explicitly recognizing the importance of other forms and sources of knowledge including informal. 'Environmental education values all different forms of knowledge. Knowledge is diverse, cumulative and socially produced and should not be patented or monopolized' (ICAE, 1992, p. 1).

The field of environmental adult education, however, is complex, dynamic and integrative - one that brings together various principles, frameworks and methods. Clover and Tan (2004) have established this perspective through an international review on adult environmental education literature. While there are no definite characteristics of effective environmental adult education, scholars (Esteva & Reyez, 2004, p. 187) have developed indicators for measuring the effectiveness of environmental adult education programs. These include: i) development of new practice; ii) increased participation or mobilization; iii) change in behaviour; iv) linking between local and global context; v) production or recovery of knowledge; vi) new legislation or policies; vii) increases in self-sufficiency; viii) increases in cooperation; and ix) generation of new networks or collaboration.

Some of these indicators are reflected in the emerging framework of community-based education for sustainable development as proposed by UNESCO in recent times.

Underscoring the need and mutual usefulness of environmental education and community-based conservation, international organization like UNESCO suggested a broader framework on community-based education for sustainable development (UNESCO, 2005). According to this framework, a key objective of the next decade (2005-2015) is to take a community-based approach to implementing educational activities and programs at all levels (local, regional, national and international) because sustainable development cannot be pursued at only one level. This framework assumes that the impact of sustainable development, however, is most strongly experienced on livelihood and natural resources use at the local level, and therefore recommends that environmental education for natural resources conservation must be rooted at the local level – starting from and aiming to address grassroots realities (UNESCO, 2005).

Drawing from the environmental adult education literature, the concept and practice of community-based environmental education have also influenced the agenda of governments. The Environmental Protection Agency (EPA) of USA has adopted a community-based education approach in designing and implementing their environmental education programs (Andrews et al., 2002; EPA, 2000). According to EPA (2000), an effective community-based environmental education is both art (it recognizes and builds on the strength of local communities) and science (applies a portfolio of enabling skills to work with local communities or groups) and has the following four characteristics:

- i) Local base is fundamental: The local interests of community members are identified and their own resources are put to use. The local concerns and strengths are, therefore, prioritized in action.
- ii) Collaboration is powerful and practical: The stakeholders (people with different interests, knowledge and values involved in projects) are working together towards joint action. However, building and sustaining such local partnership requires effective and interactive leadership who are interested in not just achievement of targeted outcomes, but also in strengthening community-based collaborative processes such as building partnerships and maintaining effective and open communication within communities.

- iii) Informed action is empowering and productive: Effective community-based environmental education is active and well-informed. Local social, economical and cultural context, resources, needs and strengths are woven into action strategies. These participatory action strategies should address substantive issues which the community perceives as worthy and relevant to address. The resulting outcomes of such well-informed community-based environmental education are durable such as positive change (in terms of behaviour) and empowerment.
- iv) Effective community-based environmental education is proven: Various techniques and tools of educational research for promoting action and lasting change (e.g. in behaviors) are put in use so that current conditions are well explained and their possible outcomes are envisioned.

Effective environmental education, either from the perspectives of environmental adult education, community-based or socially-critical approaches, shares some common features. Both socially critical and environmental adult education approaches strive for empowerment among students and teachers for social transformation and change, whereas community-based environmental education is targeted towards behavioral changes and empowerment through participatory processes. All three approaches also support the philosophical ideology of inventive paradigm, particularly the critical construction of knowledge in democratic and socially just ways. However, the contribution of the community's own knowledge as a useful local resource is neither adequately acknowledged nor sufficiently evident in the field-based implementation of all three EE approaches. The potential of EE that builds on local community knowledge to promote CBC is still to be realized. However, realizing this potential is a challenge (see Section 2.2.2.2) as combining formal and local knowledge is often difficult.

2.4: Creating knowledge in action for effective community-based conservation: Challenges and approaches

Conservation scholars such as Brown (2003) have noted that combining TEK and environmental education in managing CBC as a significant challenge. However,

environmental education literature highlights the ways in which such a challenge can be addressed. Some of these challenges and possible ways to address them are briefly outlined in this section.

2.4.1: Challenges of knowledge fusion: Issues of relationships and power

As noted by Berkes (1999), the incorporation of TEK into formal education systems has been largely ignored. The roots of understanding of this neglect are evident in the educational ideologies of Freire (1968), Gandhi (Chand, 1996) and Nyerere (Semali & Kincheloe, 1999). They regarded the formal education as an oppressive tool in the political sphere and suggested their alternative models of education as a liberating force for the oppressed or those disadvantaged through colonization. In order to facilitate exchange or integration between the two knowledge systems, it is useful to compare them. The features of local and formal knowledge systems that distinguish their nature, transmission and functions are summarized in the following table:

Table 2.2: Local knowledge (LKS) and Scientific Knowledge (SKS)

LKS	LKS AND SKS	SKS
Holistic	COMMONALITIES • Systematic observation of Nature • Generation of detailed and empirical knowledge about natural phenomena and ecosystems • Predictive power • Cultural/regional context provides basis for interpretations	Mainly reductionist
Traditional		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-contextualized
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: Compiled from Agarwal, 1995; Berkes, 1999; Kimmerer, 2000; Letsoko, 2003

The integration of local knowledge raises the issues of origin and use of the term local knowledge itself. For example, Simpson (1999) in her extensive review of studies of the Aboriginal perspective on the use of local knowledge in Canada suggested that such integration should be handled with great caution. She and several others (Stevenson, 1998; Graveline, 1998) have argued that documenting and inserting only selected and convenient elements of local knowledge systems such as TEK into western or formal science may result in misinterpretation and misuse of TEK. If continued, such an extractive practice may eventually lead to the marginalization of local Aboriginal groups including TEK holders and, in some cases, overexploitation of medicinal resources-- in other words-- yield a distinctive form of oppression known as eco-colonization (Stevenson, 1998). Any educational approach to critical construction of knowledge through synthesizing local and formal knowledge should be sensitive to community concerns in use of the local knowledge to avoid the trap of eco-colonization.

Agarwal (1995) labeled these attempts as 'ex situ' conservation of local knowledge in which the formal knowledge system (e.g. Western science) attempts to 'sanitize' the local knowledge systems by 'scienticization'. To counteract this so-called 'scienticization' of local knowledge systems, some scholars have emphasized Aboriginal perspectives, pedagogies and holistic vision of integration, in contrast to the fragmented approach advocated by Euro-centric or Western perspective. This has been demonstrated by 1990's North American Aboriginal educators like Lipka (1990), Kawagley (1993) and more recently by Cajate (1995), Graveline (1998) and Battiste and Henderson (2002). Along the same line, Orr (1992) has proposed a concept of 'ecological literacy' – which means dialogical education and learning happen through mutually helpful linkages between indigenous knowledge holders and formal schooling systems. However, Simpson (1999) constantly reminds us that there are very few good examples of such integration which gives true and equal partnerships to Aboriginal knowledge holders as exemplified in co-management arrangements for sustainable conservation and management of wildlife, plants and other natural resources in Canada, India and New Zealand.

The formal or school-based environmental education approaches sometimes also disregard the informal learning experiences and knowledge of local communities (Palmer, 1998). These inherent inadequacies of formal environmental education in capturing TEK as part of its programmatic agenda have been criticized for generating cultural alienation, poor participation and performance in formal knowledge by rural tribal children of developing countries (Jegade, 1994; Kroma, 1995) and of Aboriginal groups in Canada (Aikenhead, 2002; Battiste & Henderson 2000), Australia (Mitchie, 2002), and New Zealand, (Roth & McGinn, 1997). In fact, North American educators like Ilich (1983) and Orr (1994) have criticized the formal schooling for imposing 'superior truths', which often proved detrimental to the local knowledge systems. At the community level, the formal schooling and knowledge systems reinforce disregard and devaluation of local knowledge systems, resulting in the loss of the intergenerational transmission and erosion of such knowledge (Chand, Shukla & Gupta, 1996). Therefore, incorporating local knowledge systems into school curricula should be encouraged to improve the relevance, interest, cultural sensitivity, ownership and self-esteem among children and local communities.

However, it has been realized by some scholars that making division between local and formal knowledge is not useful and perhaps disadvantageous (Gupta, 1999; Letsoko, 2003). A synthesis of both as complementary to each other is therefore suggested and attempted by philosophers, scholars and practitioners of various disciplines (Raj, 2006) as well as by international agencies such as UNESCO and UNEP (UNEP, 1998; UNESCO, 1980). 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 & Collins (1987), Corsiglia & Snively (1995), Saloman (1996), Berkes (1999) and Richards (1997) as quoted in Kimmerer (2002).

The next section provides an overview of the advantages and examples of educational approaches that sought to create fusion knowledges to the goals of achieve community-based conservation.

2.4.2: Ways and examples integrating traditional ecological knowledge in environmental education for community-based conservation

The environmental education approaches envisioned by the inventive paradigm (as discussed in 2.2.2) favor critical construction of different types of knowledge and therefore are most suited to engender knowledge in action to effectively achieve the goals of CBC. A recent international trend in formal environment education also encourages the collaborative and community-based informal learning approaches to tackle local environmental issues. Palmer (1998) underscores this in her review that concludes the world's most successful programs in the future will be those in which formal and informal elements of education are supported alongside each other, with the involvement of major stakeholders. Palmer also noticed inadequate impact of formal school-based environment education programs in making desired changes and transformation and suggested that informal influences and real life experiences are more powerful than formal environmental education programs.

People often gain these formative experiences informally during their interaction with their environment and societies. Palmer (1998) recommended that future environmental education programs, in order to be effective in conservation and broader sustainability of natural resources, need to: i) recognize and build upon prior knowledge and significant life experiences; and, ii) recognize the importance of knowledge gained through living and interacting in communities. In other words, socially acquired knowledge is distinct from formal knowledge. Local knowledge systems could become a key vehicle in shaping informal learning through life experiences, particularly among rural and tribal communities.

The need for integrating alternative knowledge or informal learning experiences in environmental education and science education has been recognized recently due to its effectiveness in improving learning experiences (Chawla, 2001; Palmer, 1998; UNESCO, 1999). Informal learning experiences that children gain from the local community and environment thus become useful channels of environmental learning. There is a growing

attention to community-based environmental education or informal learning in addition to the focus on school-based or formal education and non-formal education.

The literature on ways and methods of facilitating such fusion of knowledge, however, is scanty (Semali & Kincheloe, 1999; Gardner & Shukla, 2002; Chand, 1996) or more focused on non-formal environmental education programs for the high-school or post-secondary education. Non-formal environmental education programs have evolved from the camping programs in 1980's in North America. The North American Association for Environment Education (NAEE) has designed instructional programs at community or school sites which have become popular methods of incorporating environmental education in formal schooling through outdoor environmental education programs (Lori et al., 1988). Some of these programs have intentionally or unintentionally tried to bridge informal learning from local knowledge systems and formal schooling as documented in the international case studies on non-formal environmental education. Some of these examples provided in Table 2.3 give an idea of how students, teachers, and communities have joined hands and engaged in reciprocal learning in some innovative ways.

Table 2.3: Some examples of ways of linking traditional ecological knowledge with formal environmental education

- In a primary school in Bairnt Antholing, Bavaria (FRG), a class teacher together with his pupils (aged 8-10) developed a cultivated plot, a natural meadow, village pond, field with historic types of grains and wild herbs and protective hedge, created in cooperation with parents and local farmers.
- At Loreto Apruntino, Italy, school students and teachers observed the relationship between aspects of the rural environment and socio-economic and cultural living conditions of local people (professions, dialects, customs, and everyday family life). Excursions and interviews have been used as data collection tools. Results were then displayed through an exhibition on rural civilization in the local museum.
- In Czechoslovakia, Golden leaf competitions for young pioneer group (autumn 1972) were organized comprising of practical activities litter -cleaning, tree/shrub planting, promoting and practicing biological control of pests etc. undertaken by young people in conservation management and environmental studies. The object of the campaign was to involve youth in environmental issues. Each competition was judged on this practical activity and tested on actual nature trail where competitor's knowledge and experience was tested. After the district and regional level, competitions were organized at national level for up to less than 12 years group and up to 15 years group. The final contest was held in the form of a camp where the best groups participated. During camp, discussions, film-shows and excursions were also organized. Similarly, for the school children of 12-15 years, a workshop was organized in Prague in 1973-74. The 60 minute workshop had different themes of environmental education consisting of film presentations and puzzle-solving sessions followed by nature trail competition among teams of participants. For instance, the workshop on plants and animals as natural resources started with a film on conservation of protected species. Then children were asked to complete the scheme of food-chain by connecting lines through several living things, and finally a natural trail competition.
- West Virginia case study provides a pedagogical method which imparts the students to combine outdoor nature studies and Native American studies. Winter Lodge is a 2-day and one night program developed for grade 5 students. The uniqueness of the program lies in its approach, which combines educational techniques and principles with the use of dramatic techniques.
- A teacher in Junagadh forest district of Gujarat, India, inspired students to collect different shapes and types of plant thorns with support of local shepherds and village communities. These thorns were later organized in educational charts and a small less-known village school received honor and award in state science competitions.
- Learning through Landscapes in UK (www.ltl.org.uk) and Natural Learning in the United States (www.naturallearning.org) have encouraged local communities and students to explore local natural resources by turning their school yards into experiential open access natural areas.
- The Foxfire Approach in Appalachian Georgia State of U.S.A has inspired high school students and teachers to learn Basic English through oral histories and folkways of native Appalachian everyday life in nature. Based on experiential learning approach, this experiment has produced magazines and a series of books which are valuable references for schools to learn about native knowledge. The foxfire approach, which originated 30 years ago, is still recognized as a model for school reform demonstration programs in the United States.
- Rediscovery is an outdoor environmental education program initiated in 1978 in British Columbia, Canada. It has expanded into an international activity with 40 or more such regular annual programs in North America. The native elders and local experts provide ecological teachings in a camp through folksongs, nature trails and local cultural forms for native and non-native young students.

Source: Center for Educational Research and Innovations (1991), Chand and Shukla (1998), Chawla (2001), Henley (1996), Saveland (1976), and Starnes (1999).

The examples provided in the Table 2.3 also demonstrate a diversity of methods and techniques that have been employed in linking local knowledge systems with formal education or schooling. Barring few exceptions, most of these efforts have been limited to short-term projects and somehow could not become a regular part of the mainstream or formal education due to a variety of reasons. Nonetheless, these programs demonstrate that students, teachers and communities have successfully joined hands, shared their knowledge, established common grounds for communications, and engaged in reciprocal learning in some innovative ways.

2.4.3: Initiatives showing ways and examples of linking local knowledge with environmental education from India

The incorporation of local knowledge systems into curricula has largely been attempted by development NGOs and a few isolated, but motivated, educators in developing countries such as India. Noteworthy in this regard are the efforts of SRISTI (Society for Research and Initiatives for Sustainable Technologies and Institutions). SRISTI is engaged in documenting and honoring the local knowledge of tribal and poor children and communities across India through innovative scouting methods like biodiversity contests (SRISTI, 1994). The Peoples' Biodiversity Registers program (Gadgil et al., 2000) is another example from southern India which developed innovative mechanisms known as the peoples biodiversity register to safeguard the intellectual property rights protection of local communities and conserve local biodiversity and associated knowledge systems.

In the state of Gujarat, the Centre for Environment Education, an autonomous organization supported by Ministry of Environment Education, Government of India, has reviewed the primary school level curriculum of environment education in order to recognize and support innovative environmental education programs in 1987 and initiated efforts to correct certain inadequacies through programs like BAIDIK⁶ (Center for

⁶ The BAIDIK (Biodiversity Awareness Integration through Documentation of Indigenous Knowledge) initiative implemented by environmental education has noted

Environment Education, 1999) at primary school level, and *Samvardhan* at the higher education level (Gardner & Shukla, 2002). Chand (1996) demonstrated that the incorporation of indigenous knowledge in the Bachelor of Rural Studies program could be achieved through individual or group student projects that focus on local practices in agriculture, horticulture, animal husbandry, animal management, veterinary science, and nutrition. Many of these NGO-led initiatives have been inspired by Gandhian philosophy of alternative education models for economically and socially disadvantaged groups, like women and tribal communities.

At the school level, similar innovative experiment in the district of Hoshangabad, Madhyapradesh was initiated by local NGO called Eklavya with the support from the university scientists. This experiment emphasized the use of educational aids made from local and low-cost material, as well as learning from the local community's daily real life experiences. The experiment was expanded to more than 500 schools in Madhyapradesh through political support from the State Government. The Hoshangabad experiment is still being regarded as successful educational reform with regard to teaching of science in schools (Rampal, 1994).

In the field of environmental education, a practical course titled 'Our land, Our life' was designed and implemented by the local NGO Uttaranchal Environmental Education Center in 1987 with the help of state and national departments of education in Himalayan region. This course encourages high school students to engage in solving local environmental issues such as land degradation using both local knowledge of elders in the villages and concepts learned through formal environmental education curriculum in schools. It is now expanded in more than 530 schools in the state of Uttaranchal, covering more than 68,000 high school students (Pande, 2001). The decade of the 1990s witnessed few such successful but scattered innovative environmental education approaches, mostly experimented by local NGOs.

that knowledge regarding ethnobotany; plant-based home remedies and eco-indicators were recurrently reported by children of five different agro-ecological zones in India.

Unfortunately, these NGO-led efforts have seldom attracted the attention of policy makers, development agencies or mainstream educators, and more specifically environmental educators, and have remained at the margin. These voices and concerns challenge the rationalistic or dominant paradigm imposed by formal environment education and reinforce the role of local knowledge (such as TEK) in achieving the local conservation and development goals through positive environmental action and community empowerment.

2.5: Chapter summary

As the literature review reveals, the traditional approaches to biodiversity conservation and development influenced by classic (protected area) and neoliberal (economic incentives) paradigms have a narrow focus and limited practical application. CBC has recently emerged as an alternative approach under a new populist tradition, which emphasizes both human empowerment and sustainable use of resources. CBC is becoming more popular than other neo-populist approaches (such as ICDP and wildlife use) for a variety of reasons, but most particularly for its ability to achieve the seemingly contradictory goals of poverty reduction and biodiversity conservation. This has spurred the interest of many conservation and development scholars across various disciplines to try to understand the conditions under which CBC has been successful. One of the effective ways to examine or evaluate the success of CBC is to understand conditions under which they evolved, sustained and achieved its goals (Berkes, 2004). Self-organization and cross-scale linkages are two such conditions that can be used to understand successful CBC initiatives. Both these conditions stem from the literature on complexity thinking (Gunderson & Holling, 2002; Levin, 1998) consistent with the learning approach (Keen & Mahanty, 2006) in community-based natural resources management and are used by several university scholars to examine successful CBC initiatives as part of the Equator Initiative of UNDP.

The literature on successful CBC also established the existing and potential contributions of local knowledge systems such as TEK in enhancing CBC outcomes (Goldman, 2003; Ribott, 1999). TEK scholars (Berkes, 1999; Zarger, 2000), however, indicate that

production and transmission processes of TEK are central to its survival, use and understanding. Scholarly literature on TEK transmission, however, is scanty (Berkes, 1999) and limited to few studies which focus on subsistence skills within single generation (Haarumaya, 2003a). Nevertheless, these studies provide useful dimensions for designing research about the process of transmission including sources, methods, age, and, to some extent, the factors affecting transmission. Any effort to mobilize meaningful contributions of TEK to promote the goals of CBC, therefore, warrants understanding of its transmission processes. Such an effort is also coherent with one of the strands of the learning approach to sustainable natural resources management, which is learning from multiple forms of knowledge including local knowledge.

On the basis of the literature, the relationship between environmental education and CBC can be expressed in two ways: i) environmental education literature that describes the inventive paradigm (Sauvé, 1992) or education for environment (Fien, 1993) approaches (community-based environmental education, socially critical environmental education and environmental adult education) which are targeted to enhance CBC; ii) CBC literature (Hackel, 1999; Kellert et al., 2000) that considers environmental education a useful tool to strengthen CBC.

The international review of trends in environmental education, however, suggests that local knowledge and life experiences of children are often disregarded in school-based formal environmental education, resulting into ineffective environmental education. In spite of little evidence of the recognition of local knowledge by formal environmental education, their mutual relationship is not always synergistic. The possible dangers of 'eco-colonization' through subjugation of local knowledge systems by formal education have been voiced by the scholars (Semali & Kincheloe, 1999; Stevenson, 1998). The successful examples that combine local knowledge and formal environmental education from North America and India are scattered (Center for Educational Research and Innovations, 1996; Center for Environment Education, 1999), less in numbers and with little impact on influencing mainstream formal environmental education policies and programs. In fact, CBC literature (Brown, 2003) also concurs with this finding and

considers integration of local knowledge and formal environmental education as a significant challenge. Environmental education approaches that embrace such an integration or fusion can generate 'knowledge in action' (Blaike et al., 1997) and can become effective tools in enhancing outcomes of CBC.

Chapter 3:

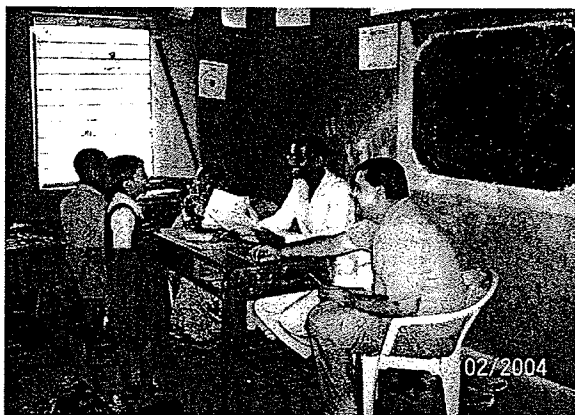
Research Methods



Inception workshop in Amboli



Recipe contest in Baripada



Biodiversity contest in Amboli



Interactive Forest walk with local healers in Baripada

3.0: RESEARCH METHODS

3.1: Philosophical orientations

The term 'paradigm' was popularized by Thomas Kuhn (1962), who used it to describe a common set of philosophical beliefs and assumptions shared by a group of researchers. These assumptions were either related to the nature of phenomena or object (ontological) and/or nature of production and dissemination of knowledge (epistemological). In this research, I refer to 'paradigm' as a school of thought or a broad set of philosophical traditions followed by a community of scholars for understanding, conducting, and disseminating research.

Pragmatism, for example, endorses the idea that research questions should guide methods and paradigms that underlie the methods (Tashakkori & Teddlie, 1998). Further, though pragmatists acknowledge the role of human experiences in constructing reality, they also accept the notion that a single explanation of reality is not always the best and multiple explanations are possible (Johnson & Onwuegbuzie, 2004). The pragmatists paradigm for guiding research indicates that 'what works' is multiple methods (qualitative and quantitative methods) and subjective and objective points of view depending upon the nature of the research questions.

The philosophical orientations of pragmatism mesh well when one is undertaking interdisciplinary research within the fields of CBC and TEK. These fields recognize the existence and importance of human (social) and natural (ecological) worlds and the complex linkages among them. For this reason, pragmatism was chosen as the central paradigm this research. Following the pragmatist credo, this research used various data collection methods (as described later in Table 3.1 and Section 3.4) in a participatory way through consultation with members of local communities and key informants. The responses of communities are largely reflected in reporting the findings following the pragmatist's acknowledgement of the role of human experiences or subjective views in

constructing reality. In addition, this research has an explicit commitment to understanding and revealing local knowledge systems such as TEK— a community's own knowledge— which has been often marginalized by more powerful formal knowledge and research (Simpson, 1999). The inherent inequalities of power relationships between local and formal knowledge systems have been discussed under critical traditions (Battiste & Henderson, 2000; Semali & Kincheloe, 1999). In this way, this research is also influenced in a broad sense by a critical paradigm⁷.

3.2: Mixed-model design

The tenets of pragmatisms are reflected in the mixed methods approach, which suggests that research questions should lead research methods and not vice versa. Mixed method approaches combine qualitative and quantitative methods to provide the most practical or workable solutions to design objectives, data collection and analysis as envisaged by the pragmatist philosophical traditions. Two major types of mixed-method research are: a) mixed model; and b) mixed methods (Johnson & Onwuegbuzie, 2004). The mixed model design mixes qualitative and quantitative approaches within (e.g. use of interview schedule with a standardized quantitative measurement rating scale), or across (research objectives, data collection and analysis/interpretation) the stages of the research process. This research followed the across-stage mixed model design in which qualitative and quantitative approaches are combined across the three main stages of designing research objectives, data collection and analysis as described in Table 3.1.

⁷ I am aware that previous research on local knowledge and formal education in social sciences is largely informed by a critical approach. The reference to critical orientation in this research is made to highlight the contributions of local knowledge in environmental education. This research thus applies a critical approach through consideration of local knowledge in the fields of natural resources management and environmental education.

Table 3.1: Scheme of across-stage mixed model used in the research

Research issue	Data collection methods	Data analysis
Self-organization and cross-scale linkages	Qualitative: workshop, semi-structured interviews, focus group discussion, relevant documents, observation	Qualitative: Coding and categorization
Outcomes of two CBC initiatives	Qualitative : workshop, semi-structured interviews, focus group discussion, observation Quantitative: Evaluation reports on biodiversity assessments, demographical data on land use, agricultural production from Government records	Qualitative: Coding and categorization Quantitative: Growth (percentages), frequency distribution
Transmission of TMK	Qualitative: informal and semi-structured interviews, focus group discussion, interactive forest walks, observation Quantitative: teacher-made skill- ranking scale	Qualitative: Coding and categorization Quantitative: Frequency distribution, averages, Mann-Whitney U test
Community-based environmental education approaches	Qualitative : biodiversity contests and recipe contests, semi-structured interviews, focus group discussion, observation	Qualitative: Coding and categorization Quantitative: Frequency distribution, averages

The research stages within mixed design research are, however, flexible (non-linear), iterative and interactive, where changes can occur and at any stage which then informs other stages of the research (Johnson & Onwuegbuzie, 2004). In fact, these features of mixed methods research correspond with the interactive-adaptive approach of research in the field of natural resources management, which provides flexibility in design and use of methods (Nelson, 1991) and is recommended for complex resources problems and environmental issues.

The selection of methods was based on the nature of research issues and participant's preferences, as discussed below. In the data analysis phase, also, the use of a mixed methods orientation became obvious where computer software such as SPSS was used for generating quantitative data (e.g. organizing data on crucial skills obtained from

village healers and computing their relative average scores) which were either directly used in research findings or further explored through qualitative techniques (e.g. scores obtained from older healers were shared and compared with the scores and learning preferences of younger healers). The field research was accomplished through a variety of data gathering methods under the case study design.

3.3: Selection of cases, communities and sites

3.3.1: Case study approach of research

Given the complex, distinctive and non-predictive nature of the research, a case study was considered as an appropriate mode of inquiry. As Yin (1984: 2) aptly establishes, "...the distinctive need for a case study arises out of the desire to understand complex social phenomena". According to Yin (1993) and Bassey (1999), the case study refers to an enquiry into a real-life context, drawing on multiple sources of evidence, which may or may not be guided by theoretical propositions. The case study design is most suited to accessing multiple sources and employing multiple data collection tools, as envisaged by the mixed-methods approach. An exploratory case study design, which examines the cases for possible concepts or theories (Yin, 1993), was used, mainly to examine the two CBC initiatives and to understand the process of transmission of local knowledge. The reasons for selection of the exploratory case design were: i) availability of relevant literature on key concepts such as CBC, TEK and environmental education which can be linked to the analysis; ii) prior-access to information on two community-based conservation cases as indicated in Section 3.3.2; iii) past experience of the researcher in conducting case study-based participatory research with school children, particularly in organizing biodiversity and recipe contests, and iv) compatibility with the expertise of faculty members who supervised this research.

3.3.2: Process of selection of cases and criteria

Before the start of field activities, a series of consultations was held at the Center for Community-Based Resources Management (CCBRM) at the Natural Resources Institute (NRI), University of Manitoba (UM) between April 2003 and October 2003, in order to

develop a sharper understanding of key concepts such as CBC and TEK. I was coordinating a weekly seminar series during this period, which involved four masters students from NRI, and mentored by various faculty members from University of Manitoba. The purpose of this seminar series was to discuss and deliberate on conceptual issues and research methods relevant to each student's research proposal. This was organized under the guidance of faculty members at the NRI and under the team project jointly supported by International Development Research Center (IDRC) and Equator Initiative (EI) of UNDP, Washington. This series made a very valuable contribution in terms of the selection of site/communities, the field research methods to be used, as well as clarifying research objectives.

The three main criteria used to select community-based conservation cases were: i) a track record of participatory management through international recognition for community-based conservation/development; ii) evidence of successful use of local knowledge in conservation and/or development (for example, establishment of a network of local knowledge experts, local knowledge databases, national recognition for such work); and iii) willingness of the key persons associated with the initiatives to participate in the study. These criteria were applied to select two CBC initiatives from India as described below.

The first case selected was RCMPCC (Rural Communes' Medicinal Plant Conservation Center) in consultation with faculty members at NRI, University of Manitoba and representatives of UNDP, Washington. The RCMPCC was recognized by the Equator Initiative of UNDP as an outstanding example of community-based conservation in the year 2002 and one of the 27 finalists who received such global recognition. It achieved great success in advancing the cause of medicinal plant conservation while creating alternative livelihood opportunities through participatory and collaborative modes such as the development of community network of herbal production centers and collaborative botanical inventories. The key leader of RCMPCC was contacted through e-mail and telephone in May 2003 and a copy of the research proposal was shared with RCMPCC. RCMPCC sent its consent to conduct research in its field sites in May 2003.

The second case, Baripada's Forest Conservation, was selected in close consultation with an international NGO called SRISTI (www.sristi.org), which has been active for more than a decade doing outstanding work on documentation, dissemination and value addition to environmental-friendly grassroots innovations and traditional knowledge. SRISTI was selected as a reference point considering my past association, working relationship and internationally-recognized outstanding work in the field of traditional knowledge and green grassroots innovations. SRISTI also highlighted Baripada's conservation initiative in their international newsletter *Honeybee* and provided them an opportunity to participate in a global contest for local knowledge innovations organized by a Rome-based International Fund for Agricultural Development (IFAD). SRISTI was identified as the focal point for organizing the global contest on local knowledge-based grassroots innovations in South Asian region by IFAD. IFAD recognized Baripada's efforts in conservation and self-driven development in the contest held in 2003 and gave them an award based on being one of the best examples of 'local knowledge and innovations' from the Asian region in 2003.

The tribal and remote village of Baripada has been conserving Forest Department's Reserved Forest of 445.28 hectares since 1993 mainly through community-crafted access, resource-use, and conflict-resolution rules. The State Forest Department, after realizing the community spirit, legitimized the informal village Forest Protection Committee into Joint Forest Management protection committee in 1999 and honored Baripada with a cash award of Rs 1 lakh (\$2800 CAD). The coordinator of SRISTI and another local NGO called Jan Seva Foundation working in Baripada were contacted to ascertain general consent to conduct research.

3.3.3: Selection of field sites and schedule

The field research was primarily based on work within two villages that were part of the RCMPCC and Baripada forest conservation initiatives and were chosen according to three criteria: i) willingness of the village community to participate (judged by researchers/contact NGOs on the basis of preliminary visits and interactions with villagers); ii) presence of a school in and around (within manageable distance) the

village; and iii) overall spirit of cooperation in study (as determined by contact NGOs, [i.e. RCMPCC and SRISTI]).

The field research commenced with an inception workshop organized at RCMPCC office, Pune in November 2003, where the project design, objectives and criteria for field site selection were shared with RCMPCC staff and their technical advisors. Based on the feedback obtained in this workshop, three field sites were finalized and visited in the month of December 2003. These sites were the project areas of RCMPCC typically known as Medicinal Plant Conservation Areas (MPCA) and included: i) Kharpud MPCA (Central Maharashtra); ii) Leghapani MPCA (Northern Maharashtra); and iii) Amboli MPCA (Southern Maharashtra). During visits to these MPCAs, local consultations with the village leaders including *panchayat*⁸ representatives, local management committee and self-help group members were held and forest walks with local healers were organized. Applying the three criteria mentioned above, Amboli and Baripada were chosen as the final two field sites. The second inception workshop was organized in August 2004 at Baripada, which was attended by community leaders, self-help group members, members of Forest Protection Committee, members of Baripada Youth Association and villagers. Baripada villagers provided verbal consent and demonstrated overwhelming spirit to be part of this research.

Both villages were visited three times from 2003 to 2005. I stayed more than three months in each village during the second phase of my fieldwork and most of the field research methods were employed during the period from January 2004 to November 2005. In addition, Pune, Sawantwadi, Kolhapur, Nagpur, Nandurbar towns in Maharashtra and Bangalore, Karnataka were visited in order to meet key people from the Forest Department and NGOs, who were associated with the two cases. Center for Environment Education (CEE), in collaboration with several national and international agencies such as the Ministry of Environment and Forests, UNESCO, United Nations

⁸ *Panchayats* are the political and democratic council of elected representatives for decision making and implementing social, economic and local development matters at any given local level within the state.

Environment Programme (UNEP) and IDRC, organized an international conference on Education for a Sustainable Future at Ahmedabad in January 2005. My participation in this event helped in connecting with national and international experts and exchanging ideas on some of the preliminary research findings. The entire field research took place in three phases from August 2003 to February 2005. A detailed month-to-month account of field activities is provided in the Appendix A.

3.4: Data collection

Considering the scope and nature of the research objectives, a variety of data collection methods were used. The main methods used were interviews (semi-structured and informal-conversational), focus group discussions, interactive forest walks, biodiversity contests, recipe contests, and community workshops. Participant and non-participant observation was used along with these methods to impart better understanding and helped in triangulation. What follows is a general description of methods used in this research. The detailed explanation of the methods used to address specific research objectives is presented in each of the next three chapters.

3.4.1: Interviews

Two types of interviews were used in this research: i) less formal or semi-structured (where the interviewer can modify sequence of questions to elicit desired responses from the interviewee/s but does not significantly alter the nature of questions except for wording); and, ii) informal (where the interviewer builds questions on a set of key issues on the basis of the responses emerging from the conversations with interviewee/s) (Cohen, Manion, & Morrison, 2000). Semi-structured interviews were mainly used to collect data for all three major research objectives (Table 3.1). However, in some cases, a mix of two or more type of interviews was used. For instance, in order to collect data on TMK transmission, the informal or conversational type of interview was used in the first round to seek a broad list of the crucial skills required to become practicing healers. Once a list of crucial skills was compiled, it was then further probed through semi-structured interviews with healers (see Chapter 5, Section 5.1). Semi-structured interviews were also

used to seek feedback on biodiversity contests and recipe contests with suggestions for their improvement from the participants (See Chapter 6, Table 6.1). Both semi-structured and informal interviews were conducted in local languages with the help of village-based research assistants. The interviews conducted with the senior Forest Department officials and key persons of community-based conservation initiatives were undertaken to collect data on self-organization and cross-scale linkages (See Table 4.1 and 4.2), were conducted in English and audio-recorded. The rest of the interviews were recorded in Marathi by the research assistants and translated in Hindi (in Amboli) and Gujarat (in Baripada). Both of these Indian languages were my first and second native languages and therefore their transcription in English can be considered accurate.

3.4.2: Focus group discussion

Focus group discussion was used in this research as a group interview technique, normally to elicit interactions and views from usually 6-12 members of relatively homogenous groups (e.g. same sex, age or profession), on specific issues/research questions (Cohen, Manion & Morrison, 2000). In successful focus groups, participant's own voices and views naturally evolve in a short time, with very limited interventions by a facilitator or moderator. In this research, the focus groups were organized in two ways: i) as a stand-alone method (e.g. focus group with local healers to obtain ranking on crucial skills required to become practicing healers); ii) combined with other research methods (e.g. such as focus groups with research participants (school children and women) that were organized following the semi-structured interviews to triangulate data and to generate additional information on effectiveness of biodiversity contests and recipe contests as described in Section 6.1.3). Focus group discussion with the various members of local management structures from Amboli and Baripada were also organized to collect data on self-organization and cross-scale linkages at the village level (Table 4.1 and 4.2, Chapter 4) and also to evaluate the outcomes of community-based conservation initiatives (Section 4.4, Chapter 4). The proceedings of these focus groups were moderated and recorded by research assistants in local languages, which were then translated into Hindi and Gujarati.

3.4.3: Forest walks

Participatory walks originated in the Participatory Rural Appraisal (PRA) approach and combine aspects of informal interviews and spatial mapping to observe and record local land use and agro-ecology. The informal forest walks organized in this study are a form of participatory walk (Martin, 1995), wherein the researcher walked with healers in a nearby forest area and through informal conversation compiled a list of crucial skills required to become TMK practitioners. Through field notes, the researcher recorded data from observations and interviews. Some of the skills of plant identification and habitat were practically demonstrated by some healers during these walks. These methods were also used earlier by local NGOs such as FRLHT and RCMPPC in various parts of India (Shukla & Gardner, 2005). These walks were organized and involved most healers (N=33) from both sites, who participated in this research (see Section 5.1).

3.4.4: Biodiversity contests and recipe contests

SRISTI has developed and successfully used innovative participatory methods such as biodiversity contests (Chand, Shukla & Gupta, 1997) and recipe contests (Honeybee, 1999; Shukla, 2004) to document and disseminate the traditional knowledge held by school children and women in rural and economically poor regions of India. I had used these methods while working with SRISTI during 1996-2000 (Chand & Shukla, 2004). Biodiversity contests are organized to uncover the rural and tribal school children's traditional knowledge of local plants in a healthy competition mode. Recipe contests are used mainly among rural women to document their traditional knowledge about uncultivated plants in making culinary dishes that have some medicinal or health value. They follow the same process as biodiversity contests, except that participants are village women and girls. The detail processes of the contests and subsequent data collection methods are described in sections 6.1.1 and 6.2.1, respectively.

3.4.5: Observation

Participant and non-participant observation have been prescribed as useful data gathering tools to complement other qualitative field research methods. In participant observation, the researcher directly observes research participants through collaborative engagement in research activities, while in non-participant observation, the researcher observes the research participants without any direct involvement or formal engagement (Cohen, Manion & Morrison, 2000). In this research, both kinds of observation were used, keeping in mind the comfort zone of research participants, ethical concerns and research objectives. During the biodiversity contests and recipe contests, the researcher was directly working with children and teachers. At the same time, he was trying to understand the participants' views on effectiveness of these methods (participant observation). However, in order to understand the process of transmission, the researcher observed the local healers, their routines and practices (such as apprenticeship), without being involved. In addition, the researcher, as a non-participant observer, gained a better understanding of local institutional, social and political dimensions through attending village leaders' meetings, local healers' workshops, and monthly meetings of local management committees and self-help groups.

3.4.6: Community workshops

Community workshops are well-known participatory research data collection methods used to gather/share views/ ideas and brainstorm issues related to planning/feedback on specific research topics (Chambers, 1994). Small community workshops (three at each site) were organized at three stages: i) project inception/design workshop was organized to get participant inputs on project design/objectives/plan); ii) interim sharing workshops were organized to share preliminary findings of research and to verify those findings; and, iii) final sharing workshops were organized to present revised findings and to seek final inputs of participants on findings. The proceedings of the workshop were recorded in local language and summary reports were shared with village representatives. The project inception workshop yielded useful feedback from the villagers with regards to

scheduling of field activities, arranging logistics and some changes in the implementation of research methods like biodiversity contests (Section 3.5). The interim and final sharing workshops helped in verification and sharing of key findings (Section 3.6).

3.5: Interaction- adaptation in the field

As the research progressed, there were changes in the sub-questions in one specific objective, changes of research methods or data sources in some cases, and finally changes in the time/phase of research, particularly in Baripada. These changes were driven by the new field insights that emerged either from my field interactions or new conceptual understanding from literature. This followed the interactive-adaptive approach (Nelson, 1991), which suggests that there should be some flexibility in research design and objectives based on feedback from research participants, self-reflection and emerging context.

Throughout the field research, I tried to stick to the original plan of working on the same set of objectives and it was generally achieved, except for some minor changes in the sub-questions. The first objective on self-organization and cross-scale linkages had a list of sub-questions that evolved after deliberations in the seminar series and three workshops held on the EI project at CCBRM, NRI, University of Manitoba. After spending some time at both field sites, I realized that both CBC initiatives had a short history without any baseline data. Therefore, measuring their achievements in terms of biodiversity conservation and poverty alleviation using scientific indicators would not be possible. The indicators for measuring biodiversity conservation and poverty reduction were subsequently redefined in the field (Table 4.6, Chapter 4).

Changes in research methods were also the result of participants' preferences. It was suggested in the inception workshop at Amboli that the criterion of number of plants brought should be replaced with the number of plants listed (Section 6.1.1) in evaluating participants of the biodiversity contests. This was suggested to avoid over-extraction of plants from the same location and more importantly to protect the rare plants in particular

from the participants. In Baripada, community members suggested that the biodiversity contest be organized in Bopkel village, since the village had no secondary school. At both locations, through deriving inspiration from the successes of the contests organized in secondary schools, primary schools expressed interest in having similar contests for their students. Subsequently, biodiversity contests were organized in the primary schools in simpler and enjoyable ways such as drawing contests (on interesting ecological features of local interest), or bringing leaves (Amboli) and a quiz on local uses (Baripada).

In Amboli, there were small changes in scheduling the contests, but they were accommodated within the total time available for field work. The field research activities in Baripada, however, were modified for the following reasons:

- During the preliminary field visit to Baripada in December 2003, it was realized that June-July were the busiest months for the villagers, being a paddy transplanting season. These were also the months when villagers would mostly be staying in the paddy farm. Hence, it was difficult to get their dedicated time for the research.
- The local contact NGO Janseva Foundation, suggested that September –October would be the best months for the uninterrupted availability of villagers. However, entering into the village in the months of July-August would help in developing familiarity and rapport building with villagers.
- The schools in this region usually reopen in late June or July. Since the research required involvement of local schools, late July-August were thought as suitable months for organizing biodiversity contests.
- July and August are the heavy rainfall months in Baripada. Notably, Baripada receives more than 80 percent of its annual rainfall in these two months. Extreme weather conditions and the isolated location of the village on a hilly terrain make the access to the village even more difficult. The only linking bridge with Baripada washed away due to heavy rain, when field work was scheduled to begin.

- For these reasons, the field activities could not start as planned. There had been some delays in organizing activities with and getting responses from school teachers in both villages due to their engagement in examination and school administration. Nevertheless, when the situation normalized the field activities in Baripada picked up faster than Amboli.

3.6: Data analysis, validity and sharing

3.6.1: Data analysis

The transcripts of interviews and focus group discussions were translated into English with the help of professional translators and finalized in consultation with research assistants and contact NGOs. With the use of Excel, the responses of different questions were entered (as text of original response) organized and sorted in different columns. The final texts were coded using qualitative data analysis techniques and tools (Strauss & Corbin, 1990), through which common, converging and recurring themes or patterns were constantly reviewed and regenerated. This approach of analysis suits well with the interactive-adaptive approach (Nelson, 1992), wherein the nature of research is emergent rather than predefined. In addition, statistical software such as EXCEL and SPSS (V. 13.1) were used for performing statistical functions such as computation of frequency distribution, averages, standard deviations (Table 5.1) and Mann-Whitney *U* analysis ((Table 5.5), particularly in comparing the relative preferences of old and young healers on crucial skills required to become TMK practitioners.

In analyzing self-organization and cross-scale linkages, the themes for coding and categorization were informed by pre-coded checklists developed at CCBRM, which were originally derived from the relevant literature on community-based conservation (Section 2.1, Chapter 2). The analysis of transmission was also partly guided by earlier works on transmission of TMK (FRLHT, 2000; Ohmagari & Berkes, 1997; Ruddel, 1993) as described in Chapter 5. The analysis of biodiversity contests and recipe contests as community-based environmental education approaches (as a part of the third research objective) was conducted in light of community-based environmental education

principles (Andrews et al., 2002; EPA, 2000) and other literature on community-based environmental education (Chapter 2). While these theoretical and conceptual frameworks provided useful lenses for analysis, the subjective inferences or the research participants' voices dominated the analysis following the interpretive or pragmatic orientation and mixed-model design.

3.6.2: Validity and sharing

In applying mixed-methods approaches, validity or legitimating strategies are still evolving (Johnson & Onwuegbuzie, 2004). The most important aspect of validity followed by this research was that the data collection, analysis and research findings 'must respect the perspectives of the actors in that situation' (Maxwell, 1992, p. 290).

One of the key strategies to achieve such interpretive validity suggested by Maxwell (1992) and used in this research is face validity or confirmation/validation of the research findings by the research participants. Sharing and verification of the data was followed during various stages of the research (see Sections 3.4.5 and 3.4.6). In addition, triangulation through the use of participant and non-participant observation and village-based community workshops (Section 3.4.6) also helped in establishing validity of the research. The research design has a built-in component for sharing of preliminary research findings. This was achieved through three methods as described in Table 3.2.

Verification was achieved through sample checks with healers, school teachers, women, and school children. In addition, written verification at Amboli was obtained on the local language report with local healers, local community leaders, school teachers, RCMPCC staff, and forest functionaries. Additional verification at Baripada was accomplished through small group meetings with research activities as depicted in the printed photographs as well as through visual presentation on a laptop. The result of the research has been widely shared in various national, international conferences and some of them have been published in the proceedings, local newsletters, technical report, and a book chapter.

Table 3.2: Schedule of sharing strategies

Field site/ Partners in Sharing	Time of Sharing/ Verification	Method of sharing	Components of sharing
RCMPCC, Pune	July 2004	E-mail, workshop, Individual consultations with key people	Draft technical report in self-organization and cross-scale linkages
Amboli	July -August 2004	Small group meetings with self-help groups of women, Written report with colour photos in Marathi given to all self-help groups, all Forest Department staff up to district level and Additional Chief Conservator of Forest, Maharashtra, RCMPCC, Thesis advisor, IDRC, New Delhi and IDRC, Ottawa, Separate Workshops with local management committee members, local healers.	Main research highlights on TEK transmission, participation and performance of children in Biodiversity contest, RCMPCC's work related to TEK, Individual profile of selected winners from biodiversity and recipe contests, Summary of key issues emerged in all field consultations.
Baripada	January 2005	Small group meetings with self-help groups of women, Special workshop with local Forest Protection Committee, Individual consultations/presentation of photos/main highlights with Conservator of Forest, Dhule division, Maharashtra and Forest Department staff, Small group meetings with local healers.	Main research highlights on TEK transmission, participation and performance of children in Biodiversity contest, RCMPCC's work related to TEK, Individual profile of selected winners from biodiversity and recipe contests, Summary of key issues emerged in all field consultations.
RCMPCC, Pune, And field sites of Amboli, Bopkel, Baripada	January-February 2005	Two copies of Multimedia CD with photos and small videos left at each of four sites.	All the photographs pertaining to all field consultations organized at both sites as well as slide show of research activities, in chronological order. Printed Photo albums were shared at Baripada.

3.7: Ethical Considerations

A suitable research ethics protocol and procedures which was appropriate for cross-cultural research in the Indian context was developed and observed. The Joint Faculty Research Ethics Board at University of Manitoba approved the research protocols (Protocol No. J2003:141) for this study. Written and oral consents of research participants were obtained in local languages. Continuous feedback from the participants was encouraged throughout the study, which provided the opportunity for the local community, teachers and school administrators, government agencies and contact NGOs to review the proposed research and to input into its development .right from the beginning of research. Following the suggestions of village healers, botanical names of local plants and detailed description on their healing practices were avoided throughout, particularly in Chapter 6, except wherever permitted. The outputs of research activities including the local language reports, focus group discussions and major findings that emerged from the research were shared and refined in consultation with research participants through various means as indicated in Table 3.2.

Chapter 4:

Two Community-based conservation initiatives



Conservation resulted into Improved Agricultural production in Baripada



Recognition of local healers by Forest Department in Amboli



Empowerment of Women in Amboli

4.0: COMMUNITY-BASED CONSERVATION: TWO INDIAN INITIATIVES

This chapter describes the activities and outcomes of two CBC initiatives in rural India. Consistent with the first research objective, self-organization and cross-scale linkages are the central considerations of this research. As discussed in Chapter 2, these considerations are identified in the literature as two critical conditions for successful CBC initiatives. Both of these considerations or terms are inclusive and may cover a wide range of sub-categories, as illustrated by Berkes and Seixas (2004). In addition, they may provide significant information about the context within which CBC initiatives have emerged. Understanding the context of CBC is critical in generating learning about the evolution of initiatives, the use of various systems of knowledge including the local, and the role of education and learning through interactive processes and partnerships characteristics of CBC. Based on the available research on self-organization and cross-scale linkage of various successful CBC initiatives (Berkes & Seixas, 2004; Seixas et al., 2006) and in consultation with the Equator Initiative research team at NRI, sub-categories for these two aspects of CBC were chosen and further explored. These categories include: origin and triggers, community-organization of human and other resources and use of multiple sources of knowledge. The cross-scale linkages are described and examined through major horizontal and vertical linkages among various stakeholders. Drivers for bilateral linkages in a cross-scale network for RCMPCC initiative are also examined.

Even though the selected field research site for RCMPCC initiative was Amboli, RCMPCC is a state-wide initiative and therefore, the research findings for RCMPCC initiative are based on data collected from a variety of key sources from different locations (Table 4.1), mainly from Amboli and Pune. The checklist developed at the Center for Community-based Resource Management (CCBRM) at the Natural Resources Institute (NRI), University of Manitoba, was the main instrument used to collect data on self-organization and cross-scale linkages (See Appendix B). Various documents including the impact assessment reports provided by Rural Commune (RC), Mumbai were also useful in generating some insights and refining the checklists. Table 4.1 and 4.2

provide detail on data collection methods, sources, their locations and purpose for studying self-organization and cross-scale linkages in RCMPCC and Baripada initiatives.

Table 4.1: Primary data collection sources used for self-organization and cross-scale linkage in RCMPCC initiative

Nature and number of participants	Research Methods	Purpose	Place
RCMPCC staff, consultants Forestry students /interns and advisors (12)	Workshop (1)	Sharing of research design, purpose and site selection	Pune
RCMPCC management and staff (4)	Semi-structured interviews (4)	Data collection on self-organization & cross-scale linkage	Pune
State, district and Range Forest officials involved in genesis and growth of the project (6)	Semi-structured interviews (6)	Data collection on self-organization & cross-scale linkage	Sawantwadi, Nagpur, Kolhapur, Pune, Panji (Goa)
FRLHT representatives (2)	Semi-structured interviews (2)	Data collection on self-organization & cross-scale linkage	Amboli and Bangalore, (Karnataka State)
RCMPCC 's community organizers (3)	Guided focus group discussion (1)	Scheduling of research activities	Pune
Forest Department staff at village and range levels (3)	Semi-structured interviews	Data collection on self-organization & cross-scale linkage	Amboli MPCA
Members of local management committee	Semi-structured interviews (3) and focus group discussion (1)	Data collection on self-organization & cross-scale linkage	Amboli MPCA
Members of local management committee/Self-help group/ Villagers/ Community leaders/school teachers /village forest staff (11)	Workshop (1)	Sharing and feedback on research design, purpose, Scheduling of research activities	Amboli MPCA
Members from self-help group (2)	Semi-structured interviews (2)	Data collection on self-organization & cross-scale linkage	Amboli MPCA
Members of the local management committee/self-help group (varied in numbers, range 8-12)	Focus group discussion (3)	Site selection	Amboli, Honyakoli and Leghapani MPCAs

Note: The figures in the brackets in the first two columns indicate the number of participants/methods.

Table 4.2: Primary sources of data on self-organization and cross-scale linkages in Baripada initiative

Nature of research participants	Research Methods used	Purpose	Place
Representatives of SRISTI (3)	Informal interviews	Site selection and secondary data	Ahmedabad
Representatives Janseva Foundation (Local NGO active in Baripada (3)	Semi-structured interviews	Scheduling of research activities, Sharing of project design, purpose	Pune, Aurangabad and Navapur
Local Forest Department staff viz. DCF and Local forest guards (3)	Semi-structured interview	Data collection on Self-organization & cross-scale linkages	Pimpalner and Dhule
Members of Baripada Forest Protection Committee (8)	Focus group discussion (1)	Data collection on Self-organization & cross-scale linkages	Baripada
Selected key individuals identified through local consultations (3)	Semi-structured interviews	Data collection on Self-organization & cross-scale linkages	Baripada
Women Members of self-help group	Small group discussion (1)	Data collection on Self-organization & cross-scale linkage	Baripada
Local healers of Baripada (6)	Small group discussion (1)	Data collection on Self-organization & cross-scale linkages	Baripada
Members of village youth association (4)	Small group discussion (1)	Data collection on Self-organization & cross-scale linkages	Baripada

Note: The figures in the brackets in the first two columns indicate the number of participants/methods.

In addition to these data collection methods, the researcher took part in the training programs of Barefoot Botanists and Hirnaykeshi self-help group organized by RCMPCC. Random field visits to the farmers who undertook the cultivation of medicinal plants inspired by RCMPCC in proximity to Amboli MPCA were also made. The researcher was invited as an observer to attend the three internal review meetings of RCMPCC, which helped to understand the management of RCMPCC. Participation in these exercises helped in gaining additional insights and verification of secondary data on self-organization and cross-scale linkages. The findings pertaining to this objective were verified with RCMPCC and the villagers of Amboli and were brought out first in local language and then, in English as a technical report for a wider circulation (Shukla, Gardner & Sinclair, 2004).

The second field site of Baripada was suggested by SRISTI and selected on the basis of the same criteria of site selection used to select Amboli MPCA, outlined in Chapter 3. The field research in Baripada was largely conducted in consultation with the Janseva Foundation, a local NGO that has been working in and around Baripada for more than a decade. The key people associated with the initiative were consulted in the beginning. The project inception workshop was organized with villagers of Baripada, which was useful in modification of research design and selection of research participants.

The researcher observed communities closely through participant observation techniques in both field sites, spending more than four months at each site. This helped in observing communities closely and triangulating the data obtained from interviews and focus groups in the villages.

4.1: Description of the two field sites

4.1.1: Social, economic and ecological features of Amboli and Baripada

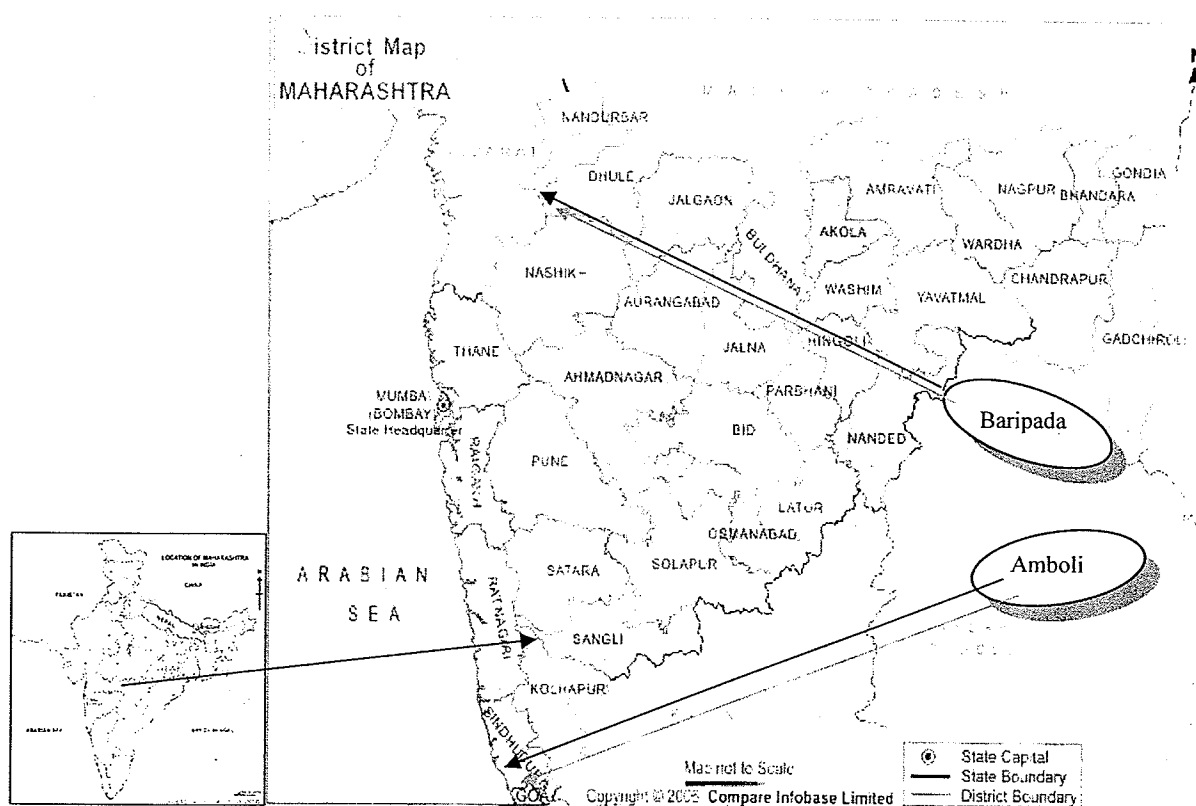
Amboli is located in southwestern district of Sindhudurg, bordering Karnataka and Goa, and a popular tourist attraction with a well-developed infrastructure. Tourism is a main business in Amboli; it has a well-developed government and private infrastructure, access to concrete roads as well as markets and year-round transportation. The village, inhabited by a diversity of social groups, has good education facilities and literacy levels. Baripada is a small remote, tribal village with a population less than 800 located near the border of Maharashtra and Gujarat. The physical and educational infrastructure is extremely weak as compared to Amboli and most of the villagers are engaged in subsistence farming. However, Baripada's community conservation area is almost double than that of Amboli and is gaining increasing attention for educational and ecological developmental explorations. The demographic and ecological characteristics, livelihood activities and social features of Amboli and Baripada are summarized in Table 4.3.

Table 4.3: Demographic, ecological and social characteristics of two field sites

Characteristics	Amboli	Baripada
Population and governance	3647, Household= 991, Own village council (panchayat)	786, Household= 101, Attached to group village panchayat of nearby Manjari village
Social groups	Two groups: <i>Marathas</i> and <i>Gurav</i> considered as higher castes. About 10 % of lower castes include <i>Dhangar</i> , <i>Chamar</i> , <i>Jadhav</i> etc.	All tribal. But two main groups are <i>Pawar</i> and <i>Chaure</i> . A small Proportion of <i>Bhils</i> also included.
Relationship among social caste/groups	<i>Marathas</i> and <i>Gurav</i> had a longstanding history of religious differences for the old village temple. Social mobility between these groups strictly discouraged.	There is a good trade and social relationship among groups. Marriages can be possible among all community groups.
Altitude	690 m from sea level	Approximately 350 m from sea level
Dominant plant species	<i>Diospyros candollena</i> , <i>Chinka kalingan</i> , <i>Maba nigricans</i>	<i>Madhuka indica</i> , <i>Azadirachta indica</i> , <i>Tectona grandis</i> , <i>Carissa karonda</i>
Dominant animal species	Wild buffalo, variety of snakes, rabbits, Blackbuck, mongoose, termites, small insects, variety of birds	Crabs, rabbits, snakes and monitor and other lizards, reptiles, hyena, wolf, variety of birds
Ecological significance	Five rare, endangered and threatened species found. Beginning of western ghat- one of the biodiversity hotspots.	Dry deciduous forests surrounding village making basin, Perennial water sources.
Evidence of use of local knowledge	Database on local healers and their area of specialization, local healers organized and recognized by Forest Department and NGOs. Local healers participated in plant mapping with researchers from national and international institutions.	Local healers used in Forest Protection Committee and preparation of community-based plant diversity register, village healers recognized by NGOs and Forest Department, Profile of some healers published by NGO.
Track record of local Conservation and development	Local management committee recognized by RCMPCC as the best field site for medicinal plant conservation, RCMPCC recognized by Equator Initiative of UNDP in 2002 as an outstanding CBC initiative from equatorial region.	Award by the State Forest Dept for Community-based Forest Conservation, Honored by IFAD for outstanding example of 'local knowledge and innovations; from Asia region in 2003.
Average annual rainfall	700-750 cm	500-550 cm
Area conserved	445.28 hectares	267.63 hectares
Forest type	Dry deciduous with patches of evergreen	Semi-evergreen forest
Education	Fairly developed residential secondary school facilities to grade 10, primary school, early child-care center.	One classroom primary school with grade 1-4, Students go to nearby village for secondary education.
Literacy	High: Approximately 75 % male and 50 % female.	Poor: 5 % male and 1 % female.
Main occupations	Small tourist hotels and restaurants, agriculture, livestock, few government jobs.	Subsistence agriculture, some cash crops like potato and onion.
Physical infrastructure	Mainly brick and concrete houses and shops. On State highway, stone roads in some streets, primary health center, natural tourist attractions such as herbal garden, sunset point, waterfalls.	No approach road, nearest gravel road in Manjari village (5 km). Primary health center in Warsa village (8 km), not much tourist activity, occasional educational tours by secondary school/college students.

Source: Compiled based on village records of local Revenue and Agricultural departments

Figure 4.1: Map of Maharashtra State in India



Source: www.mapsofindia.com

4.1.2: Rural Commune's Medicinal Plant Conservation Center: A state-wide community-based conservation initiative

RCMPCC is an innovative state-wide initiative for the in situ conservation and sustainable utilization of the diversity of medicinal plants of Maharashtra state through developing partnerships among the Forest Department, local communities and NGOs. The RCMPCC, in collaboration with partners, organized several activities, but most importantly the establishment of a network of 13 medicinal plant conservation areas (hereafter referred to as MPCAs), each ranging from 250-400 hectares. The MPCAs are selected through consultations with the Forest Department, local communities and available scientific literature and were based on four main criteria: i) relatively undisturbed forest areas representing different bioclimatic zones; ii) forest areas with rich biodiversity; iii) areas with natural availability of water (micro watershed); and iv) locally and otherwise known for

harboring medicinal plants. In these MPCAs (including Amboli), RCMPCC has documented 50,000 plants, representing more than 50 different species. The MPCA created through these projects were legally notified by the State Forest Department as conservation priority areas and have inspired other state and national governments to include them in their conservation and development agenda.

Other activities of RCMPCC in and around MPCAs included: organization of participatory environmental education programs such as the barefoot botanist workshops; local healers conventions, and the establishment and training of local management structures such as the local management committees and self-help groups. RCMPCC organized a range of training and capacity building programs for members of the local management committees, self-help groups and local Forest Department staff on production, processing, and marketing of herbal products. As a result of these activities, RCMPCC 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 in order to revitalize the local health traditions. (RCMPCC, 2003)

Amboli MPCA has been known for its active response to the variety of RCMPCC activities, where field research took place. Out of 255 medicinal plant species documented, 146 species were found with unique medicinal uses. The list of rare endangered and threatened (RET) plant species from Amboli MPCA has been prepared (with English and Marathi names) and disseminated among members of the local management committee, self-help group, local healers and local forest staff. The local management committee of Amboli was registered as an official village cooperative body with 13 members, including nine women in September 2001. Amboli has more than 16 women's self-help groups engaged in production and sale of herbal products and micro credit. Amboli has also been the most preferred MPCA for organizing and showcasing RCMPCC activities including two village biologists workshops, two healers conventions and a biodiversity assessment studies by the Department of Science and Technology of India and International Timber Trade Organization (Japan), to name a few. Amboli has been considered one of the best MPCAs by RCMPCC. RCMPCC has received international recognition from the Equator Initiative of UNDP for its outstanding

efforts in community-based medicinal plant conservation in 2002. It has also been identified as a state resource agency by the National Medicinal Plant Board, New Delhi.

4.1.3: Baripada's community-based forest conservation initiative

Baripada village initiative has emerged in 1993 as a response to the livelihood crisis resulting from a dwindling local natural resource base. One youth, Mr. Chat, mobilized the village community and formed an informal village Forest Protection Committee in 1993. The committee crafted and enforced a set of access, resource use, and conflict resolution rules to prevent pressure on this reserved forest. The original rules, however, were subsequently adapted in the wake of new experiences and changing needs of local communities. The Forest Department recognized the community spirit of Baripada at a later stage. The informal committee of Baripada originally created for the purpose of forest conservation was legitimized under the Joint Forest Protection program (JFM)⁹ by the State Forest Department (MFD) in 1999. The major JFM activities included planting of woody tree species on the hedges, annual harvesting and sale of minor forest produce by community, and monitoring the progress of forest conservation through a monthly meeting by JFM committee with representation from community leaders, village women, local healers and local Forest Department staff.

The community spirit that evolved and was nurtured by this self-crafted local, innovative institution in Baripada spawned a series of other community-based income-generating activities such as collective fish farming, community-based plant diversity register, and establishment of self-help groups of women in the village. These local conservation initiatives helped the village become self-sufficient in fuel, fodder and local timber needs. The water table in the village was also improved over the last decade and the village has not

⁹ The Joint Forest Management Program (JFM) was introduced in 1990 as part of a new forest policy which, for the first time, recognized the local communities (which live in and around forests) as partners and usufruct rights holders of the forests. Local community's efforts in conservation and management of forest lands and joint partnership models of West Bengal provided successful models of JFM. By 1999, many Indian states adopted JFM programs and policies for participatory restoration of degraded forest lands.

only become self-sufficient in terms of meeting its water requirement for domestic and agricultural purposes, but it also made the village an important hub for supplying water to surrounding villages through its perennial sources. Two NGOs from Maharashtra -- the Vanwasi Kalyan Ashram and the Janseva Foundation -- have helped in streamlining and strengthening community organization for designing and implementing various village development activities. The village is now becoming a role model in the area of CBC of natural resources and attracting attention of other NGOs, academic institutions, government departments and political leaders. The results of Baripada community efforts received the best JFM village award by State Forest Department in 2000. It also earned local and international recognition. The Rome-based International Fund for Agricultural Development (IFAD) honored them for their self-designed and implemented CBC and development work in the Asian region in 2003.

4.2: Self organization

Self-organization is one of the key evolutionary characteristics of complex systems and as mentioned in Chapter 2, section 2.1 is used to understand and describe the success of CBC initiatives (Berkes et al, 2003; Gunderson & Holling, 2002). The self-organization in RCMPPCC and Baripada Forest Protection Committee initiatives are examined through the subcategories of: catalytic elements and triggers (which are responsible for giving birth to local initiatives), community's organization of human and monetary resources, use of different knowledge sources including local knowledge, and evidence of adaptive learning for sustainable use and management of resources. These sub-categories are derived from and were used by a team of researchers under the learning and exchange component of the Equator Initiative of UNDP at CCBRM, of the University of Manitoba (http://www.umanitoba.ca/institutes/natural_resources/nri_cbrm_projects.html).

4.2.1: Origin of the initiatives

CBC initiatives either originate from local demands or are driven by external inputs from outsiders (local or outside NGOs, international donors). These project initiators are often described as trigger events and catalytic elements (Seixas et al., 2006). Trigger events are the drivers or motives (events or processes) that lead communities to organize towards initiative.

Catalytic elements are the factors or conditions which may not be as explicit as trigger events but, nonetheless, enhance the speed of the processes of community organization. The origin or trigger events (for example, ecological crisis of local resources through over extraction) and catalytic elements (external funding or capacity building opportunities) act as a change or surprise that helps in evolving and sustaining the complex system like CBC.

4.2.1.1: Rural Commune's Medicinal Plant Conservation Center: Creating a platform for synergy with international funding

The RCMPCC was officially launched on 31 December 1999, but its community-based field activities commenced in February 2002 in Amboli. The initiative was originally submitted as a national project for funding under a specific thrust area – conservation and sustainable use of medicinal plants-- to UNDP. The Bangalore-based NGO, Foundation for Revitalization of Local Health Traditions (FRLHT) was the main implementing agency at the national level. The state level execution was entrusted to the Mumbai-based NGO, Rural Communes (RC). This initiative borrowed its vision from FRLHT's earlier work in the southern Indian States of Kerala, Karnataka and Tamil Nadu that originated in 1993. FRLHT also established three MPCAs in Maharashtra through partnerships with the State Forest Department (1997-2000) with funding from a local trust, the Sir Dorabji Tata Trust (SDTT). The RC was the strongest claimant for such partnerships in Maharashtra and thought by FRLHT as the most appropriate implementing agency in Maharashtra. Recognizing the opportunities for collaboration, RCMPCC was created by RC as a dedicated institution to experiment with a new model for community health improvement. This community-based model was a replica from FRLHT's earlier work in southern India and has an integrated focus on livelihood generation through medicinal plants, use of local knowledge systems, and biodiversity conservation in collaboration with the State Forest Department. FRLHT's expansion plan and readiness of RCMPCC, backed by funding support from UNDP, created the platform for synergistic and symbiotic relationships and triggered this CBC initiative in the State. The conviction and commitment of the senior Forest Department officials at the State level provided a significant stimulus for the initial start-up of CBC activities. During the inception stage of the initiative, a series of State level workshops were held between partnering NGOs and the Forest Department to prepare a plan of action. For

example, the Forest Department being the owner of most reserved forest and protected areas in the state was thought to be best suited for the identification of project sites or MPCAs. The criteria for identifying MPCAs were jointly decided upon in these workshops. Continuous orientation to the initiative and learning from these workshops was an important catalytic element in faster dissemination, acceptance and implementation of the initiative.

In Amboli, additional income generation was a motivating factor in community organization. 'In the first community workshop, community leaders repeatedly asked us how this initiative will provide employment and income to village people' (personal interview, SG, local management committee member and Forest guard, Amboli). In addition, the participation in the weekly temple committee gathering by the Range Forest Officer (RFO) helped in continuing communication and sustaining interest of the community in the initiative. The involvement of the Forest Department at various levels right from the onset mobilized the community's commitment to the initiative. The community's interest and involvement was gained and boosted through monetary incentive, international funding at the State level, and income generation at the village or MPCA level.

4.2.1.2: Baripada forest protection: Local leadership motivated response to crisis

In May 1990, a youth in the small and remote village of Baripada was deeply concerned by the ever-increasing incidence of cutting of teak and other trees from the adjoining forest by outside traders. The forest of 445.28 hectares was the key natural resource in meeting the livelihood needs of the villagers of Baripada and neighbouring villages. The forest was well endowed with many woody and timber species including highly-valued teak (*Tectona grandis*) and attracted the attention of outside commercial harvesters. The forest was owned by the Forest Department under the Reserved Forest category but was poorly monitored by local Forest staff. The villagers of Baripada mostly watched over it. Increasing incidences of indiscriminate cutting of teak and other trees by outside traders and commercial harvesters led to the shortage of firewood, food, and water for Baripada villagers. The man-made crisis of natural resources essential for survival acted as a trigger event in organizing Baripada villagers.

‘The over extraction of trees and clearing of forest were turning our evergreen into a barren sand pile. Supply of fuel wood to the villagers became irregular and unstable. The number of natural wells in the village had been decreased from 40 to 15, and villagers had to look for water sources surrounding villages to meet their needs for water, both for domestic and agricultural uses’(personal interview, CP, Baripada).

The worried youth, Mr. Chat, conducted a series of village level meetings with five to six elders and community leaders in search of a local solution to the dwindling forest, hitherto conserved and monitored by Baripada village community. The community leaders shared his concern over indiscriminate cutting and realized that if depletion persisted, no more fuel wood and minor forest products would be available in the long run. Following meeting with the elders, Mr. Chat started with consensus building meetings with a small group of villagers, but not many people were interested in attending those meetings. In fact, some did not like the idea and considered it a futile exercise. However, a series of consensus building meetings helped in identifying four to five key persons with a genuine interest in protection. These key persons also happened to be community leaders who generally were consulted for resolving community issues.

In the midst of uncertainty of ‘what to do’ to protect the forest, Mr. Chat had to seek medical treatment for illness in a nearby town of Warsa, where he met Dr. Pat. Dr. Pat was a volunteer working for a local NGO, Vanwasi Kalyan Ashram, and was interested in the health improvement of local tribal communities. During general discussion, Mr. Chat sought advice from Dr. Pat on Baripada’s willingness to protect the forest. Dr. Pat, as an immediate measure, sought the help of the Range Forest Office. The Range Forest Officer was helpless to offer any direct solution to stop indiscriminate cutting from a large forest area. Instead, he provided saplings of 11,000 eucalyptus trees from the Department’s nursery. While this ‘quick fix’ formula offered by the Forest Department did not work as a long-term solution, it did provide an opportunity for Dr. Pat to visit Baripada and understand the community’s perspective on the required course of action. His visit to Baripada helped the process of local consultations initiated by Mr. Chat and encouraged local NGOs, such as Vanwasi Kalyan Ashram and Janseva Foundation, to initiate village development activities in Baripada. The

leadership of Mr. Chat and Dr. Pat and partnership with local NGOs were important catalytic elements and processes that strengthened community mobilization and self-organization of Baripada's initiative in the early stages.

Like many development workers in Maharashtra, Dr. Pat was also impressed by a great Gandhian follower and social reformer of Maharashtra: Mr. Annasaheb Hazare in the Ralegan Siddhi village in the Ahmadnagar district of Maharashtra. Dr. Pat and five community leaders from Baripada visited Ralegan Siddhi and being inspired by its achievement of becoming self-sufficient in meeting livelihood needs through community-based watershed development. Baripada villagers decided to self-experiment with similar approaches. The pending task of forest protection was found as an avenue to experiment for the Baripada villagers, now charged with enthusiasm. Driven by local leadership of Dr. Pat and Mr. Chat, they decided to self-organize to protect the declining forest cover around Baripada. The informal village institution, the Forest Protection Committee consisting of 11 community members, was the result.

The Forest Protection Committee's primary role was to keep continuous watch on the forest to prevent illegal wood theft. Mr. Chat, who was the only youth with a Masters' degree in commerce from Baripada, left a lucrative government job to pursue his passion of local tribal development. He was unanimously elected as chairperson of the Forest Protection Committee. On May 25, 1993, the first formal meeting of the Forest Protection Committee took place in Baripada. In the first meeting, a few simple rules for punishing the guilty outsiders who were indiscriminately chopping the trees were established. The adaptation and enforcement of these community-crafted rules gradually led to the effective protection and enhancement of plant species within and around the forest. Learning and adapting from successful local community-based models and leadership were other important catalytic components in self-organization of the Baripada initiative.

The major trigger event that drove the Baripada initiative was the community's response to destruction of the forest, which had largely met their livelihood needs by providing fuel wood, fodder, timber, and minor forest produce. There had also been a gradual realization on

the community's part that the Forest Department though, legally responsible for this resource, was not carrying out the responsibility of protection. The local community's stake thus became impetus to conserve the resource on which they depended on. Local community capacity was strengthened through catalytic components and processes, including learning from a successful initiative, continuous community consultations, and local leadership and to some extent, participatory efforts by NGOs like Janseva Foundation and Vanwasi Kalyan Ashram at a later stage.

4.2.2: Enabling elements: Organization of human and monetary resources

The local communities, while developing institutional responses to manage their own natural resources, organized various resources within and outside their villages. These resources – both human (in-kind support from people) and monetary (funds) – were mobilized at various stages of these initiatives.

4.2.2.1: Mobilization of financial and human resources by Rural Commune's Medicinal Plant Conservation Center

The initial funding for the RCMPCC initiative came through its parent institution: Rural Commune (RC). The funds to RC were channeled through FRLHT to carry out project activities in Maharashtra as a local implementing agency as part of the UNDP supported scheme of Country Cooperation Framework in 2000. When RCMPCC earned a reputation as an outstanding example of CBC from the Equator Initiative of UNDP, it also received award money in 2002. The money from this award was disbursed and used to start herbal product development activities in all 13 MPCAs, including Amboli. The success of the first phase of the RCMPCC initiative encouraged the Ministry of Environment and Forests of the Government of India, Maharashtra Forest Department, FRLHT and RC to continue the mission of medicinal plant conservation and development in the form of a second phase under the scheme of country cooperation framework. As a result, the second phase of this project "Conservation of Medicinal Plants for Health and Livelihood Security" was proposed for funding to UNDP in 2003. In the meantime, RC secured a bridge grant from a local trust, Dorabji Tata Trust (DBTT), to support training and community mobilization activities of RCMPCC initiative during 2003-2005. An initial orientation to the local management

structures (the local management committee and self-help groups) in Amboli were met through financial resources from Phase I. Funding for the training of self-help groups was provided by State government agencies like District Rural Development Agency and partly by the training NGOs within the state. RC also funded in part the community-mobilization activities in Amboli by convergence of their existing project funds.

In addition to these financial resources, human resources from various sources were used at different stages of the project. Individuals from the State Forest Department and members of RC governing board helped in proposal writing and establishing the contacts with potential funding partners. The State Forest Department provided the infrastructure and human resources in the beginning through their field offices at the sub-district levels. State agencies like District Rural Development Agency and local NGOs like Swayamsidha and Shramjivi Sangathan provided partial voluntary support in organizing training for the local village management committees and self-help group members.

National NGOs like FRLHT along with some other NGOs from Maharashtra helped organize programs like the village biologist and healers conventions in Amboli. The existing staff of RC also helped in the initial community mobilization activities organized at MPCAs. 'We used to have three visits per month by RCMPCC field staff and they played a crucial role in the formation of the local management committees and self-help groups' (personal interview, AG, local management committee secretary, Amboli). The local forest officials like Range Forest Officer and Forest Guards helped to establish the structure of the arch (the entrance gate) at all MPCAs, including Amboli. In addition, during the initial phase, the Range Forest Officer in Amboli regularly convened and actively mobilized community participation through weekly community meetings in the village temple.

The initial consultations facilitated by Range Forest Officer were a big surprise for many community leaders. The persistent persuasion efforts by Forest Department narrowed that communication gap between Forest Department and local communities and helped in establishing mutual trust (personal interview, AD, community leader, Amboli).

The RCMPCC initiative had significant start-up funding from UNDP and equally useful

human resource support from Forest Department and NGOs. The contributions of Range Forest Officer and village level Forest staff in MPCA such as Amboli in the establishment of project structures and community mobilization supported self-organization of initiatives at the early stage.

4.2.2.2: Baripada initiative: Little money but more human organization

The local organization of communities in Baripada started with almost no funding. When a decision to protect government forest was made in 1991-92, the only funding collected from the community was Rs.3 (about a tenth of a Canadian dollar at that time) per household in order to pay for the watchmen. The form of contributions, however, has subsequently been changed to an equivalent amount of grains. Financial and logistical support to organize educational tours for Baripada community leaders was provided by a local NGO, the Vanwasi Kalyan Ashram. The communities of Baripada also managed to get 11,000 eucalyptus seedlings from the Forest Department.

As the initiative became known for its conservation efforts, it received some monetary awards. In 1997-98, the State Forest Department awarded the village Rs.100, 000 (over \$3500 CAD at that time) in appreciation of its conservation work. Three income-generating activities were started from this money: i) a jaggery making unit, ii) a flour mill, and iii) the purchase of decorative items (such as *mandap*- wooden pillars and decorative platform customarily used during marriages) which could be rented in the vicinity of Baripada to generate additional income. The Baripada villagers then mobilized Rs 5000 from the Forest Department in return for their labor in digging and planting activities in the forest. This money was used to buy large kitchen utensils which could be rented in and around Baripada. These resource mobilization opportunities generated some revenue and avenues for other community-driven development activities in the village.

Another interesting example of self-organization through human resource mobilization was achieved through engaging children in small conservation-related development activities

such as construction of the check dams¹⁰. The slogan of '*shramdan*' (voluntary labour for public good) was gaining popularity during early 1990s in the region. The Forest Protection Committee of Baripada decided to involve school children through an idea of '*vanbhojan*' or 'forest picnic' for village children (both school goers and drop-outs). During such a picnic, village children were involved in helping with the construction of check dams by bringing small stones and were given treats in the form of *khichdi* (rice and lentil porridge) with some vegetables. In addition, there were activities to demonstrate the identification and uses of medicinal plants by local healers and explain the importance of forest and water by village elders. It also helped in developing a positive attitude and feeling towards the community-conserved forest. School children and teachers involved in these *vanbhojan* also benefited from first-hand experience of conserving water resources through collective and cooperative check dams in the forest. At the time of this research (October, 2004), 181 check dams were constructed through such collective efforts.

Besides the efforts of the children's involvement, deliberate attempts to communicate Baripada's intentions of conservation to the communities from surrounding villages were made through weekly flea markets and sports events. Both local weekly flea markets or *haats* and annual *Kabaddi*¹¹ competitions were used to convey the rules of conservation to the villagers and youth residents of more than 20 surrounding villages. As a result of this wide range of human resource mobilization activities, the villagers attracted the attention of local government and NGOs representatives.

The requirement of funding in organization of Baripada initiative was not important compared to the RCMPCC initiative. Two reasons could be offered for such a difference: a) unlike RCMPCC, Baripada started on a much smaller scale and was self-inspired; and b)

¹⁰ Check-dams are small artificial walls of pebble stones or sandbags built across the direction of water flow of running down flow or streams for the purpose of water harvesting. The small dams retain excess water flow during monsoon rains in a small catchment area behind the structure.

¹¹ Kabaddi is an Indian game with six players on each side. The player tries to cross the target line at the opposite side, saying Kabaddi, breathlessly and trying to touch players from the opposite side. The opposite side players' objective is to catch and hold the player until s/he loses breath and is stopped from crossing the centre line.

funds seem less important than immediate action by the local residents when pressures or resources or livelihood threats are more imminent as in the case of Baripada.

4.2.3: Use of multiple sources and types of knowledge for capacity building

Capacity building is commonly used to refer to a range of activities such as meetings, workshops, formal training programs, exposure tours, guided visits, and often organized by the government, NGOs or academic institutions for “educating” the local people (Berkes & Seixas, 2004). This capacity building is expected to enrich existing knowledge and skills, change values and empower local communities. Capacity building, however, in the communities followed a two-way process where both government/NGOs and communities mutually interact and exchange information from a variety of sources and knowledge systems. The two main types of knowledge are: a) community’s own local knowledge such as traditional ecological knowledge (TEK), which has been acquired through multigenerational transmission and learning-by-doing approaches; and b) formal or scientific knowledge, which is acquired in formal educational and training institutions and practiced by scientists, academics, and bureaucrats. In successful CBC initiatives, both types of knowledge are used and exchanged at various stages of the project in order to develop capacities to self-organize.

4.2.3.1: Using multiple types of knowledge and approaches by Rural Commune’s Medicinal Plant Conservation Center

The knowledge base tapped in the RCMPCC initiative was mainly local knowledge (codified and uncoded) about medicinal plants and their uses. The codified local knowledge is derived from an Ayurvedic system, which is the classical Indian medical tradition systematically documented in ancient scriptures and which emerged as a parallel and significant herbal-based alternative to allopathic medicines. The Ayurvedic knowledge base was mainly used to exchange knowledge about medicinal properties of the plants as documented in the Ayurvedic texts. RCMPCC hired Ayurvedic practitioners as community researchers, who helped in developing suitable Ayurvedic products such as herbal face packs and other herbal remedies for locally-identified common ailments. This knowledge was then shared with the local communities by RCMPCC staff through on-site training. The selection

of herbal products for a given MPCA was made according to local availability and suggestions by self-help group members. For instance, in Amboli, based on the demand for and documented knowledge of local plants from women, self-help groups were trained in making the face packs from the plants like *Bedki* (*Gymnema sylvestre*) and *Korfud* (*Aloe Vera*).

To build effective partnerships with the local knowledge experts, RCMPCC organized two programs: 1) *vaidu sammelan* or local healer's workshops, and 2) the village biologists (previously known as barefoot botanists) training programs. A group of individuals known as local knowledge experts or healers called *vaidus* were identified by RCMPCC. The term *vaidus* is a generic folk term most commonly used in the Marathi and Hindi languages to describe healers and traditional herbal practitioners, used most commonly for, but not limited to male healers. These *vaidus* possessed extraordinary knowledge and interest in the local plants, fauna and ecosystems. Many of the *vaidus* practiced herbal treatments for diseased humans, livestock, and crops and developed skills in identification and use of locally grown plants. RCMPCC recognized the creative potential of the *vaidus* as part of the village biologist program in the conservation and management of medicinal plant diversity through sustainable uses (RCMPCC, 2003). FRLHT initiated the village biologist program as a 'Barefoot Botanist program' in 1995 with the original aim to enrich the local medicinal plant knowledge of the village *vaidus* with the relevant formal botanical skills. The trained *vaidus* were expected to perform better in their own profession and in providing guidance to eco-tourists and researchers. These programs also helped in mutual learning and the strengthening of the capabilities of formally-trained botanists and local *vaidus* through dialogue and exchange of knowledge.

The purpose of *vaidu sammelan* was to: i) document the knowledge of local *vaidus* about plants; ii) encourage value-added activities by promoting local use and sale of herbal products; iii) provide a platform for *vaidus* to demonstrate their products; and iv) to provide a platform for the *vaidus* and other health practitioners to interact and encourage participation in local biodiversity conservation efforts. The village biologist program was broad in terms of coverage, with three or four local experts identified at each location. Selection of village

biologists was based on: 1) good knowledge of local plants and their uses and cultural significance; 2) interest in local environmental and conservation issues; and 3) ability to read and write. Most village biologists identified were *vaidus*, forest guards and knowledgeable elders. In Amboli, the local medicinal plant knowledge of the *vaidus* is widely recognized as valid alternative systems of knowledge.

‘This is the most commonly available knowledge in our village and people often seek our help, even during odd times such as night. We treat many villagers who have snake bites during night or are injured by black bear when we work in our farms near forest’ (focus groups with healers, Amboli).

Amboli has a public health centre but the continuous availability of allopathic practitioners is limited. The accessibility of *vaidus* at anytime, therefore, is regarded as one of the major benefits to the local communities. ‘Approaches such as the *vaidu* sammelan give our *vaidus* a community-recognized local license to practice’ (focus group with community leaders, Amboli). In addition, the village biologist program provides avenues to facilitate the use of the local medicinal plant knowledge of the *vaidus* by local formal institutions in two ways: i) *vaidus*’ knowledge about the rare and endemic medicinal plants was used in the selection of plant species in the nurseries by the Forest Department; and ii) *vaidus* learned the herbarium preparation techniques from the botanists during the village biologist program and applied their training by conducting demonstrations of local plants through these herbarium sheets in secondary schools.

The *vaidus* of all 13 MPCAs were involved in the identification of Rare, Endangered and Threatened (RET) plant species. At the Amboli and Leghapani MPCAs, *vaidus* generated a list (in the local language) and photographs of these species, for regular monitoring and regeneration in villagers’ home gardens. ‘We share the photographs and lists of rare plants with tourists and researchers, so they become extra careful with these plants when they move around in forest’ (personal interview, KG, local *vaidu*, Amboli).

At the district level, the Forest Department publicized the contributions of the *vaidus* through a special publication or in their working plans. For example, the District Forest Department of Sindhudurg and RCMPCC published a Marathi language booklet with the list and uses of

100 local medicinal plants. The Latin, English and vernacular names of the plants are listed along with their family names. In addition, a list of 113 *vaidus* with their areas of specialization and addresses is provided in the book. The book has been widely circulated among state forest officials, other state government departments, universities and NGOs. 'We have publicly honoured *vaidus* from Amboli. Some *vaidus* that were listed in the booklet are now being invited by NGOs and other government departments to participate in training and share their stories' (personal interview, RN, Forester, Sindhudurg District Forest Department). The Forest Department has also recognized *vaidus* as eco-guides in Koynanagar MPCA. RCMPCC complemented these efforts by involving *vaidus* in developing and maintaining demonstration gardens, home herbal gardens, interpretation centers and in documenting sacred groves (the local areas that were conserved by villagers for religious or spiritual purposes).

At the national level, these approaches mobilized funding support for the two studies from the Department of Science and Technology and the Ministry of Tribal affairs on standardization of selected medicinal plants in six MPCAs and a biodiversity register in one MPCA, respectively. *Vaidus* from all 13 MPCAs (three from each site) participated in the National Herbal Expo in 2000 and 2001, where they had shown their herbal products and had an opportunity to interact with government officials, NGO representatives and *vaidus* from other states.

The most visible national and global impacts of these approaches were the inclusion and recognition of *vaidus* as important project stakeholders in the new conservation and development funding plans that nine other states of India have submitted to the Global Environment Facility (GEF). The unique endemic plant species of *Ceropegia* was discovered in Leghapani MPCA (Jagtap, Deokule, & Watve, 2004). Besides a greater use of local knowledge, the RCMPCC initiative also used formal or scientific knowledge of local Forest Department staff and project staff. The local Forest Department staff in Amboli, for instance, contributed in the initial civil works related to the MPCAs such as demarcation of the boundaries and constructing fences in and around MPCAs. In addition, a variety of training programs were organized at various stages of the RCMPCC initiative.

The orientation of the local management committee members and the Range Forest Officer in Amboli was conducted by the RCMPCC during the initial stage. Local NGOs like Swayamsidha and Amchi Arogya Sathi imparted training on issues like processing and marketing of herbal drugs and value addition activities for the members of local management committee of all 13 MPCAs. At the state level, the RCMPCC organized hands-on training for the local management committee on marketing of herbal products. FRLHT had conducted CAMP¹² (Conservation Assessment and Management Plan) workshops which provided practical training on botanical inventories and participatory rapid assessment of medicinal plant diversity. The botany departments of Pune and Nagpur Universities were also involved in the CAMP workshops. FRLHT also organized workshops for senior Forest Department officials and other project partners on issues such as incorporating useful outcomes and information (such as ecological significance of various MPCAs, geographical distribution of medicinal plants) in the working plans of districts. An NGO named Amchi Arogya Sathi provided training on safer methods of honey extraction (bee-friendly) to the local management committee members. A State government training organization named Maharashtra State Industrial Technological Consultancy Organization was also involved in providing training on an issue of enterprise development through herbal products. Most of these training programs used professionals with training in formal knowledge and helped in developing technical, administrative and managerial skills.

4.2.3.2: Baripada: Building upon elders' experiences and modern agricultural knowledge

The knowledge base used in Baripada was mainly uncoded or folk stream of local knowledge resulting from human linkages partly through organizing local villagers for the development of locally-used norms or rules to manage the resource sustainably. The local knowledge experts, particularly elders from the village were strategically consulted to decide on the routes and forest areas needing closer and stricter vigilance. The knowledge of local

¹² CAMP is a process developed by the International Union for the Conservation of Nature and Natural Resources (IUCN) for identifying endangered species of the plants – 'red listed' and work out programs for their recoveries 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.

elders with regard to highly-extracted theft-prone areas (areas with high number of teak trees) was used in developing monitoring strategies. Most importantly, the local knowledge of community leaders was used in designing, communicating and enforcing the rules for forest protection. Parallel to this were several small community-inspired initiatives such as maintaining a register in village schools to correct the problem of moonlighting teachers and irregular students, formation of self-help group for micro credit and small savings, construction of stone walls and check dams to prevent run-off of monsoon water, and collectively raising a small-scale fisheries in a village pond.

As these community-initiated efforts became popular, the external agencies from both government and NGOs complemented with new information, awareness and technical knowledge-based agricultural experiments in the village. Baripada initiative also benefited from modern agricultural knowledge at the later stage, channeled through NGOs such as Janseva Foundation and Vanwasi Kalyan Ashram. Janseva Foundation helped in introducing 'Savant's Integrated Rice Agro technology' for small farmers in Baripada. This technology has four main components ¹³ and therefore became locally popular as '*chatusutri*' (four formulas). The gradual adoption of *chatusutri* encouraged other government agencies and NGOs to experiment with similar modern-knowledge oriented rural development programs in Baripada. Janseva Foundation, the Agricultural University of Parbhani in collaboration with the Wheat Research Center, Pune, also introduced a new variety of wheat called No. 2496 in Baripada and neighbouring villages. The Agricultural University of Parbhani also conducted an experimental trial of sorghum variety in Baripada. Most of formal-knowledge based efforts in Baripada focused on improvement in agricultural practices.

4.2.4: *Adaptive learning in self-organization*

Adaptive learning is an iterative, learning-by-doing management approach that aims at learning about social and ecological systems while managing them, and continually incorporating new learning to refine and improve management outcomes including

¹³ This method is a package of four practices (locale-specific application of nutrients, controlled tillers, readjusted line spacing and intercropping with crops such as *Sesbania* for green manuring) to improve paddy production in the region. It has been invented by and named after Dr Savant, an agronomist from Parbhani Agricultural University.

sustainable use of resources (Garaway & Arthur, 2002). It focuses on establishing a continuous learning process, rather than finding and employing a single solution while managing complex social and ecological systems. The adaptive learning responses in the two cases included: changes in the structure and functions of local level structures (such as Baripada Forest Protection Committee or the local management committee) and institutions (NGOs) managing resources and changes made at the higher levels of management (district, state, national or international) including government policies or legislation. These changes have been mainly made to accommodate the needs and interests of local stakeholders so that CBC initiatives remain responsive to changes and therefore self-organized.

4.2.4.1: Rural Commune's Medicinal Plant Conservation Center initiative:
Adaptation in local management structure

In RCMPCC initiatives at Amboli and most MPCAs, the local level management changes happened in the structure of the local management committee and self-help groups. As per the original structure in 1999, the formation and training of local communities (through the local management committees and self-help groups) were to be managed through the Forest Department. After the initial project management workshop, it was realized that the RCMPCC might be better equipped with the skills, experience and flexibility for working with local communities, and therefore was assigned with the responsibility of working with local communities. The roles of handling village-level activities thus interchanged between Forest Department and RCMPCC. In most MPCAs including Amboli the members of the local management committee were changed by 2001. The new members of the local management committee were chosen according to their active interest and past involvement in village development activities and not by considering their social or political status in the villages. In a few MPCAs, The local management committees were registered as cooperative societies, after they took up new income generation activities like the sale of medicinal plant saplings and herbal products in 2001.

In the beginning the RCMPCC initiative in Amboli involved one or two existing self-help groups, which had reached 13 by 2002. The initial training program for self-help groups was also uniform in its content and delivery with in the village. However, as more than one self-

help group gradually evolved within the village, the program content was revised for different self-help groups according to their interest, needs and skills. Eventually different training programs evolved for different self-help groups even within the same village or MPCA.

The linkages between the local management committees and self-help groups were made more clear and stronger in the subsequent phases of the initiative. This also led to innovative institutional arrangements between the local management committees and self-help groups in some MPCAs. For instance, in Toranmaal MPCA, self-help group women after toiling with grinding the bark of *Baheda* (*Terminalia chebula*) and *Harde* (*Terminalia bellerica*), realized that their returns on the labour was not justified in terms of money and time. The lack of electricity in the village prevented them from opting for a power-run grinder. The desirable diesel-run or mechanical grinder was not available locally. The profit from the sale of medicinal products was largely accrued by the local management committee, as per the norms, and the self-help group's share was marginal. As such, an innovative arrangement with the local management committee was sought. According to this new arrangement, the profit from the sale would come directly to self-help group and not the local management committee. The local management committee's revised role was to provide guidance in preparation and marketing of produce and make arrangements for sales through exhibitions or similar opportunities. The local management committee would be paid by the self-help group for playing such a role. In a way, the self-help group had subcontracted the part of marketing operation to the local management committee. This resulted in a larger profit share for the self-help group.

The initiative also brought some fundamental changes in the perception and functioning of State Forest Department officials. 'The work of setting up of a network of MPCAs with the active involvement of the communities changed the perspective of Forest officials towards medicinal plants, which are now being viewed as a useful forestry resource that needs to be conserved and used through local communities' (personal interview, BM, Additional Principal Chief Conservator of Forest, Maharashtra State). At the national level, the Government of India recommended promotion of 200 MPCA throughout the country in its

task force report in the year 2001. In the year 2002, the State Department of Forest instructed their District Forest Officers to include MPCAs in their working plans and job profiles of Deputy Conservator of Forests. 'In fact the idea of setting of the Medicinal Plant Boards in the year 2003 was inspired by the exemplary works RCMPCC and FRLHT in the medicinal plants sector' (personal interview, SB, senior Forest Department officer, Maharashtra State). The State Forest Department of Maharashtra has plans to introduce the species recovery and enrichment of certain medicinal plants in its district working plans based on the botanical data gathered from the inventories, local consultations and scientific assessments that resulted from the RCMPCC initiative.

4.2.4.2: Adaptation of community-designed rules in Baripada

The most evident form of adaptive learning that happened in Baripada initiative was formation and revision of the local institutional rules/norms for conservation. When the work started in 1991-92, some basic rules for protection of government forest were made. How these rules were changed with time is illustrated in the following table:

Table 4.4: Adaptive learning at local level: Changes in institutional rules for community-based conservation in Baripada

Original rule (1991-92)	Change in Rule (2001-2002)	Driver for change
Each of 89 households would contribute Rs 3 per month	Now 102 families in village. Two families who are staying farther from village have now withdrawn. The contributions of Rs 10=00 are collected annually. People can also contribute in the form of paddy and/or <i>Nagli</i> grains @ 7 Kg per family/annum.	The total collection of annual funds is substantial and helpful for annual village planning. Frequent collection reduces transaction time which could be better used for protection.
Two elderly persons from the village would be appointed as watchmen @ Rs.100 per month or equivalent food grains.	The number of watchmen reduced to one. The watchmen are now being paid annually so that they can buy groceries for a year, which is a normal custom in the village.	Initially, the fear and incidents of theft of timber/ fiber wood was very high, which has now reduced to almost zero.
Watchmen had to stay in the forest (until midnight) and report theft (if any) next day in village.	The watchmen would keep vigil only during daytime and a team of 10 youths was kept for a vigil during the night. Now seven village youths have made arrangements for permanent stay.	There were some scattered incidents of a group theft, when a group of ten people from a neighboring village came to collect timber during the night. A single watchman might find it difficult to prevent such a large group.
The conservation experiences were communicated in weekly markets.	Watchman is spreading the message of protected forest and fines.	The message is spread enough and publicized through government officials and community leaders.
The stolen timber from Bullock cart would be fined @ Rs. 1001 per incident and a person stealing wood/timber on head load(an amount that a person can carry on his/her head) would be fined Rs 501.	No change	Not much report of theft and therefore no one felt need for change.
Reward for the report of theft would be Rs. 51.	No change	Reduced number of incidents.
Just after monsoon and in early winter, Baripada residents would be allowed to take fuel wood	The period of wood removal has been expanded for one month.	Increase in family size and increase in climax vegetation. The agricultural pattern is changing and therefore household occupied agriculture has varied time availability for timber collection.
Fruits/ Flowers or any other minor forest products sold through auction every year to Baripada residents only.	The Baripada residents were authorized by Forest Department to sell only flower of <i>Mahuda</i> species in 1996-97. However after the formation of the Forest Protection Committee in 1999, villagers could sell other minor forest products too.	The Forest Protection Committee established in 1999 is now a legal body empowered with such rights and privileges.
No cattle or goats allowed for grazing in protected forest.	Some patches of 50 hectares on high elevation on hillock were opened for grazing. The fodder is never uprooted but cut and brought back to villagers to encourage the coppicing.	After more than 54 such Forest Protection Committees established in nearby villages, fodder availability in surrounding areas reduced for villagers. Changing crop patterns have reduced fodder availability within and around village. The plant heights in protected forest have increased considerably in last ten year to the extent, which would not pose any threat from trampling.

There were not any notable changes in the structure or functions of Baripada's local Forest Protection Committee except for the selection of watchmen. For example, the purpose of the annual replacement of watchmen was not because of their 'underperformance' but a collective feeling of a few community leaders, who 'do not want to encourage same persons monitoring the forest every time' (CP, interview, September 2004). There were three main reasons for doing this. The first was to ensure they did not create an opportunity for a watchman to develop 'greed' or 'lethargy' arising from overconfidence. Second, it would give opportunities to others in the village to become 'directly involved' in this important duty and make some extra money. Third, the chances of the same person serving for a long time would become more vulnerable to thieves. The structure and functions of the Forest Protection Committee were formalized, such as holding regular meetings, maintaining minutes after the initiative was officially covered under JFM in 1999. This also led to closer involvement of the Forest Department since the local forester was formally designated as a secretary of the Forest Protection Committee. 'The most important change that happened in the structure of the Committee was the increased participation of village women' (personal interview, AP, social worker, Janseva Foundation, Baripada). This was driven by two conditions: i) The State Forest Department legitimized this effort as a Joint Forest Management (JFM) in 1999, which required some representation of local women; and ii) The occurrences of theft by male thieves were replaced by 'female' thieves lately. Many a times, it became difficult for a local the Forest Protection Committee to deal with women culprits as they did with male members. Consequently, four women members were selected in the Forest Protection Committee.

The adaptations in local management structures in Amboli or community-based rules for conservation in Amboli were perceived as necessary responses to generate feedback and learning to maintain the self-organization capacity of the system. However, both these initiatives have also been influenced by and generated impact on other levels beyond local. The next section describes these cross-scale dynamics in two initiatives.

4.3: Cross-scale linkages in the two initiatives

The second consideration or dimension for examining both CBC initiatives was cross-scale linkages which help in learning through building partnerships. The CBC initiatives under investigation operated at the most basic level of the village, but have established strategic linkages with respect to funding, organization, and key partnerships at four to five different levels. These levels represent administrative and political units, often defined through their geophysical boundaries within which they operate. The most common levels observed in two study communities were: a local or community level, a sub-district (block or range level), a regional or district level, a state or provincial level, a national level, and an international or global level.

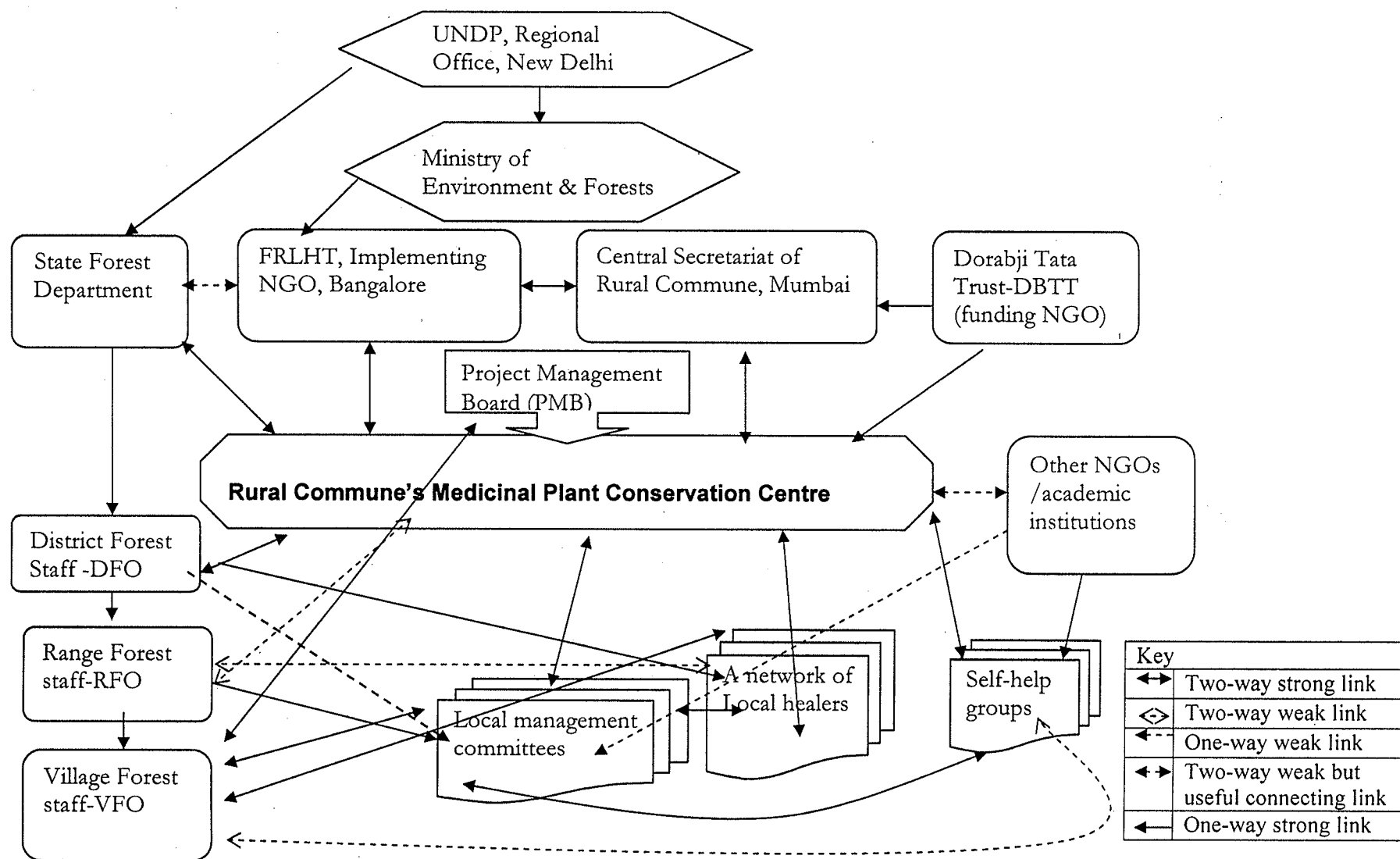
Both horizontal and vertical linkages among various actors are important to the successful implementation and sustenance of the projects. The linkages are either directional specific, i.e. pointing which actor influences direct control over other actor/s or magnitude specific, i.e. how strong/weak the link is, which helps them to be characterized as one way/two ways and one strong/weak relationship (Figures 4.2 and 4.3).

4.3.1: Rural Commune's Medicinal Plant Conservation Center initiative: Well established vertical linkages

The RCMPCC initiative had well-established vertical linkages from the beginning of the project (Figure 4.2). At the most basic level of village, the local management committees and self-help groups were created as a part of the project management, while at the topmost hierarchical order and comparatively complex international level, funding agencies like UNDP has been responsible for channeling important funding support to shape the initiative. The roles of other actors at the intermediary levels (e.g. Ministry of Environment and Forest and NGOs such as FRLHT at the national level and Forest Department at the state level) have been important to varying degrees, and their contributions established some useful links in achieving objectives of the initiative.

The initiative had a steering committee at national level with interest from the Ministry of Environment and Forests, and a project management board at the state level including representatives from FRLHT, Dorabji Tata Trust (funding agency) and senior officials from the State Forest Department. These national and state level institutional arrangements provided overall direction and vision for the initiative. The links between the Forest departments and RCMPCC /FRLHT at the state, district and sub-district levels were the strongest ones in successful delivery of the outcomes. The linkage between RCMPCC and other NGOs at the state level were not as strong but useful in organizing training and capacity activities at the district/sub-district levels. Local training /research NGOs like Swayamsidhha, Kalpavriksha and the Botany Department at Pune University were helpful in capacity building of self-help groups and MPCC staff respectively. The linkages with the government agencies such as the District Rural Development Agency (DRDA) were useful in mobilizing financial and human resources for the strengthening self-help groups through training.

Figure 4.1: Enabling cross-scale linkages helped in the achievements of project goals



RCMPCC developed very strong vertical linkages with local management committees and self-help groups through regular consultations in all 13 MPCAs, including Amboli. These linkages were partly responsible for the organization of initiative at MPCA level, particularly in terms of human and financial resource mobilization (4.2.3.1), capacity building through use of various types of knowledge (4.2.4.1), and adaptive learning (4.2.4.1).

In addition to these linkages, there were several horizontal linkages in the RCMPCC initiative, particularly observed in Amboli. The most important was the dynamic and emerging relationship between the local management committee and *panchayat*. After two years of implementation, the members of the local management committee and *panchayat* redefined their roles to avoid overlap between tasks and to accommodate the emerging needs and concerns of the local management committee. For instance, the collection and sale of timber was normally done through a middleperson appointed by the Forest Department through auction under the village council's (*panchayat*) supervision. The local management committee wanted to make use of the high revenue generated by the sale of locally valuable timber. They persuaded the village *panchayat* to take part and bid in auction. This helped the local management committees in generating additional revenue, which was used for local medicinal plants conservation related activities. There was an expected link between the local management committee and self-help groups at the village level.

Some members of local management committee were also the members of self-help groups and vice versa. The local management committee provided overall guidance and makes specific arrangements for training, market availability sale of herbal products according to the interest of self-help group members (personal interview, DG, local management committee chairperson, Amboli). In the overall cross-scale picture of RCMPCC initiative, there were some horizontal and vertical linkages that were considered crucial by key leaders associated with the initiative. 'There were very important bilateral negotiations and relationships that helped the initiative in achieving emerging demands to meet overall objectives of the projects. Some of these bilateral

linkages were task-based and episodic, while some were crucial for sustaining the project' (personal interview, SB, Ex-project Coordinator, RCMPCC initiative). Some of these bilateral linkages and their various outcomes are summarized in the following table:

Table 4.5: Important bilateral linkages and their drivers

Linkage between	Drivers
MoEF and FRLHT	Funding and vision building
FRLHT and RCMPCC	Project implementation, vision exchange
FRLHT and RC	Enhancing capacities through mutual learning, village biologist program
DBTT and RCMPCC	Bridge grant/funding for sustaining project activities
SFD and RCMPCC	Legal notification of project sites (MPCAs), channeling official involvement at lower levels
RC and RCMPCC	Parent institution, administration and overall guidance in project management
RCMPCC and DFO	District level monitoring of project activities particularly proposed and carried out by local management committees, formal institutional support in implementing project activities at district and lower
RCMPCC and local management committee	Project management at village level; feeding back inputs in design and delivery of project activities at higher level
RCMPCC and self-help group	Organizing women for income generation and health improvement
RCMPCC and Local healers network	Recognizing and rewarding local knowledge, building the involvement of healers in conservation of medicinal plants, inventorization
DFO and Local healers network	Recognizing local knowledge through incorporation in management plans of Forest Department, rewarding healers
local management committee and self-help group	Training and marketing support to self-help group by local management committee
RCMPCC and other training NGO	Training and workshops for local management committees and self-help groups
Local management committees and local healers network	Local knowledge in identifying priority species for nurseries and monitoring of forest cover, informal network building
VFO and Local healers network	Recognizing and rewarding healers in local conservation and sustainable management of medicinal plants, inventorizations
VFO and self-help groups	Channeling marketing of herbal drugs, providing information on production and processing of relevant herbs and their medicinal values

Most of the vertical linkages of RCMPCC with the actors above the level of MPCA (Table 4.5) were established for meeting time-bound specific purposes. However, some of these linkages became important in sustaining the project. For example, the linkage between RCMPCC and the State Forest Department was initially set up as a part of the pre-designed project management to facilitate official recognition of MPCAs and generating support from the sub-state level Forest Department officials in 1999.

However, after five years of implementation, RCMPCC has gained significant experience in the field of community-based forest management and was consulted by the State Forest Department in training and capacity building of officials from the Social Forestry wing. The vertical linkages between RCMPCC and local management structures (local management committee, self-help group and healers) were strong from the beginning as described earlier.

4.3.2: Baripada: Stronger horizontal linkages and emerging vertical linkages

As shown in Figure 4.3, vertical linkages are not so evident in Baripada, most having been established indirectly from stakeholders connected through horizontal links. A local NGO, the Vanwasi Kalyan Ashram, came to know Baripada's CBC through its voluntary worker Dr. P, who was instrumental in self-organization of the initiative. The Vanwasi Kalyan Ashram was thinking of streamlining its operation through a more focused approach on agriculture-based rural development activities in this region and the success of community-monitored forest in Baripada encouraged this NGO to make its base in Baripada, creating a separate institutional structure of Janseva Foundation in the village.

The Janseva Foundation expanded its activities in and around Baripada and helped the Baripada's Forest Protection Committee members to network with government departments, individuals from other NGOs and research institutions including universities. The Janseva Foundation also received a three-year grant from the International Funds for Agriculture Development (IFAD) in 1999-2000 to intensify watershed related rural development activities in and around Baripada. The district Forest Department had formalized the Baripada Forest Protection Committee under Joint Forest Management in 1999. The outstanding work of conservation continued and paved the way for a cash award of Rs 1 Lakh by the State Forest Department. The Janseva Foundation also publicized the conservation success of Baripada through its horizontal linkages with other NGOs like SRISTI. SRISTI provided a wider platform and international recognition through their newsletter *Honeybee*. In fact, through SRISTI the local conservation work of Baripada was internationally recognized by IFAD in July 2003. SRISTI organized an Asia-wide contest scouting for local knowledge and

innovations supported by IFAD. Two members of the Forest Protection Committee were invited in a conference at Bangkok, Thailand, to share their CBC experiences. SRISTI has also been inviting the representatives from Janseva Foundation and Baripada as regular participants in its annual network workshops. The horizontal linkages between Janseva Foundation and SRISTI thus facilitated the vertical linkages up to an international level and provided constant institution building support to the Forest Protection Committee.

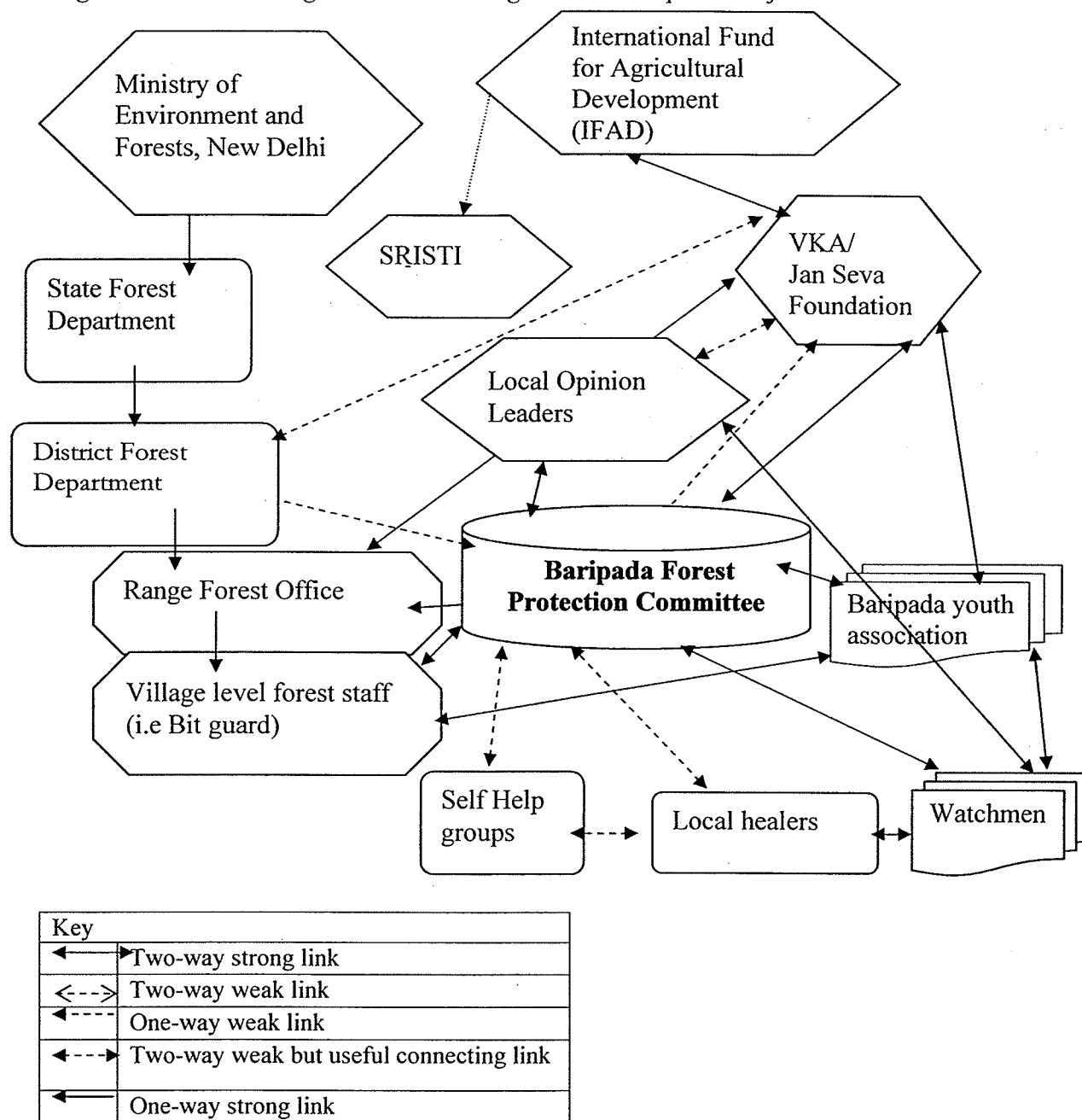
In case of Baripada, horizontal linkages (networking with local NGO) are more visible and were instrumental in establishing vertical linkages (such as linking with district Forest and other government departments). One such important vertical link resulting from this horizontal network with Janseva Foundation was involvement of the Forest Department at the range (sub-district) and a district level. The Forest Protection Committee had better commitment and closer involvement from the Forest Department after a concerned Range Forest Officer was invited as a chief guest in 1997 to an annual Kabaddi sports contest that Baripada hosts. A principal from the Wildlife Institute of India, Dehradun, made an educational trip to learn about Baripada CBC initiative in 1999. These linkages also paved the way for a 'first ever' government intervention in the form of Joint Forest Management by the State and District Forest Departments, as well as resolving the longstanding issue of land encroachment by a farmer on the fringe area of the forest. The principal from the Wildlife Institute of India (who was also a senior forest officer of the Indian Forest Service), during his visit noticed that only one household in Baripada was landless and therefore cultivating a small patch of forest land on the fringe of the community-conserved forest, which was legally owned by the Forest Department. The local Forest Department authorities followed-up on a suggestion of passing on ownership rights to that farmer so that he could legally conduct his subsistence farming. The linkages between the Baripada Forest Protection Committee with the Forest Department, however, were more evident at the village, range, and district levels due to opportunities for frequent linkages. The link between the Forest Protection Committee and village Forest staff and a Range Forest officer strengthened mutual capacities to monitor the forest. For example, the Forest Protection Committee, when it could not

handle disobedient intruders, they informed the Range Forest office, which would then jointly enforce legal action against the culprits through a public hearing in a village.

In addition to the indirect contributions by horizontal linkages, the Baripada Forest Protection Committee had also demonstrated direct horizontal linkages with local healers, self-help groups and members of village youth associations. The initial success of community-crafted rules led to the formation of a self-help group in the village.

Watchmen were recruited and paid by the Forest Protection Committee annually. The local healers from the village were included as village representatives, who provided useful contribution later in deciding strategic routes for intensive monitoring of the community-conserved forest and areas for survey and monitoring of dominant flora for the community plant diversity register.

Figure 4.3: Enabling cross-scale linkages in the Baripada Project



The strongest horizontal links among Baripada Forest Protection Committee, local community leaders, village youth association, and watchmen (Figure 4.3) have yielded effective conservation of resources and subsequent community development initiatives. Vertically, links between NGOs (Janseva Foundation) and village-based actors, including the Forest Protection Committee and village youth association, have been instrumental in encouraging local horizontal links.

4.4: Outcomes of the CBC initiatives

CBC initiatives are often evaluated on the basis of their outcomes related to the twin goals of biodiversity conservation and poverty reduction or human well-being (Berkes, 2004; Equator Initiative, UNDP, 2004; Millennium Assessment, 2005). These outcomes also reflect the effectiveness of the strategies in self-organization and cross-scale linkages. Biodiversity conservation in CBC refers to protection and/or sustainable use of species or ecosystems to ensure their long-term survival and availability (Kothari et al., 2000). Human well-being is interchangeably used with 'standard of living' (UNESCO, 2004) and is an inclusive term which includes things such as the amount of money and access to goods and services that a person has--freedom, happiness, empowerment, art, environmental health and physical health.

However, to measure biodiversity conservation accurately in a shorter time frame is not possible, due to lack of baseline information (Berkes and Seixas, 2004; Seixas et al., 2005). It has also been realized that local communities' perspectives on the benefits of CBC are different than the benefits measured by scientific assessments (Berkes, 2004). Similarly, many of these qualities or characteristics of human well-being were not easily measurable in the study communities because of their composite characteristics and the time constraints. Therefore, local communities of both CBC initiatives indicated their own set of examples and indicators which crudely measure improvements in human well-being. The community-based indicators or outcomes from both CBC initiatives were collected through interviews with key persons associated with the initiatives, as well as from the focus group discussion conducted (Tables 4.1 and 4.2) with members of village communities. These indicators were classified under three categories as indicated in the Table 4.6 based on the literature in CBC as the outcomes of both conservation initiatives (CCBRM, 2004; Conley & Moote, 2003; Millennium Assessment, 2005) and in consultations with two key persons from each initiative.

Table 4.6: Community-indicators for measuring success of conservation initiative

Category of outcome	Community-suggested Indicator
<i>Improvement in local biodiversity</i>	Change in fuel wood status, change in ground water; increase in the sightings of bird/ animals; change in rainfall; changes in population of local plants, community based monitoring of plant species/ forest
<i>Human well-being</i>	Participation of women in community economic activities; empowerment of local healers, improvement in family income due to agricultural production or sale of local herbal products; change in local cropping pattern ; improvement in access to irrigated land; increased number of self-help groups within village

The improvement of local biodiversity indicators were mainly suggested by, and applied in Baripada. In Amboli, RCMPCC compiled some scientific assessments of medicinal plants based on information available from their earlier programs like CAMP or the village biologists programs, and local healers' workshops which integrated community-based indicators. During inception workshops in both sites, it was also realized that indirect assessment in terms of increase in micro credit groups such as self-help groups and increase in financial balance of village-based groups, such as the local management committee and self-help group, should be considered as appropriate substitutes to measure income improvement. The group level or general indicators on improvement of human well-being in terms of participation of women and increase in number of self-help groups were also emphasized as useful criteria by local communities. The indicators suggested in Table 4.6 since compiled from both sites, might vary in terms of richness and availability. In addition, accurate and site specific data on some indicators, such as sightings of wildlife or amount of annual rainfall, were difficult to obtain and could not be included in reporting of the outcomes.

4.4.1: *Improvement in local biodiversity*

The study communities systematically monitored the change in the status of local biodiversity being conserved, such as species (for example medicinal plants) or ecosystems (for example forest). They noted improvement in related natural resources (rainfall, ground water, wildlife). However, in both the initiatives baseline data were not collected and therefore scientific comparisons over a long period can not be made. What

follow, therefore, is the community's accounts of monitoring the change in local natural resources. In both CBC initiatives, local villagers have been engaged into long-term monitoring of natural resources either through systematic protection of certain plant species, or complete mapping and periodic monitoring of ecosystems through locally developed innovative arrangements such as biodiversity registers.

4.4.1.1: Rural Commune's Medicinal Plant Conservation Center initiative: In situ conservation of medicinal plants

With a primary goal of in situ conservation of medicinal plants, RCMPCC initiative started with the selection of 13 biodiversity-significant areas, or MPCAs. Gradually, MPCAs were designated through official notification by the Forest Department and supported by local communities as sustainable local use areas. As a result, the conservation status of certain other fauna, insects, and butterflies -- and to a point the whole ecosystem -- improved. Some facts noted by RCMPCC (RCMPCC, 2004) highlighting local biodiversity assessment and improvement are provided as follows: In the state of Maharashtra, 13 MPCAs (150ha – 635ha each MPCA) were earmarked for conservation by the Forest Department in partnership with the local communities and RCMPCC. These MPCAs were granted a legal status through notification by the SFD declaring them long-term medicinal plants reserves. So far, 26% floral diversity and 29% of medicinal plants have been recorded from these sites.

Out of the threat category of 54 candidate species (as per the red data list of IUCN) 26 species were assigned to various red list categories namely critically endangered [CR], endangered [EN] and vulnerable [VU]. Of these 26, 20 species have already been recorded and consequently are being conserved in various MPCAs.

Seven forest nurseries have been established for the local/community collection of planting material seeds or prioritized species from distribution range in the state.

1210 botanical surveys covering 45 % of MPCAs have already been completed. Through these surveys, herbarium records for 804 species have been prepared.

The RCMPCC initiative provided some example of how the community was involved in monitoring and protection of threatened plant species. For example, the villagers at Amboli were engaged in continuous vigilance over the illegal and indiscriminate extraction of endangered plant species, *Narkya* (*Nothopodytes nimmoniana*) by outside traders. The local management committee of Bhaskaracharya prevented illicit cutting of the highly traded species of sandalwood (*Santalum spp*) tree from the MPCA. The women of Vasai MPCA prevented illegal cutting of trees from the MPCA with strong opposition. The villagers around the Gullarghat MPCA controlled excessive grazing by the passing herders in their MPCA through periodic inspection. The local management committee mobilized the local residents of Sawarna to start patrolling their MPCA at night to protect valuable medicinal plants and wildlife. These community-driven initiatives and stewardship have provided a ready platform for partnerships with the Forest Department in sustainable management of forest biodiversity and ecosystems. At all MPCAs, a list and photographs of rare, endangered and threatened plants found in MPCA have been generated by RCMPCC and made available to the Forest Officers and members of the local management committee to strengthen species monitoring. The surveys conducted by RCMPCC suggest that MPCAs are becoming a major gene pool of plant diversity in Maharashtra through harboring more than half of the State's flowering species, nearly half of flowering plants genera, about one-fourth of the medicinal plants and flowering plant species, as indicated in Table 4.7.

Table 4.7: MPCA's contributions towards medicinal plant conservation in the State

Indicator	Reported in Maharashtra	Found in MPCAs	% of total reported in Maharashtra State
No. of flowering plant families	187	115	61.49
No. of flowering plant genera	1081	500	46.25
No. of flowering plant species	3025	850	28.00
No. of medicinal plants (FRLHT Data)	2100	470	22.38

The participation and contribution of local healers or *vaidus* and village biologists through CAMP, local healers' conventions and village biologist programs is crucial in the collaborative assessment and monitoring of medicinal plants. At the state level, the collective documentation and collaborative research with the *vaidus* helped in creating a database of medicinal plants and herbal formulations. These databases provided useful information about the rare, endangered and threatened (RET) plant species that were prioritized for conservation and regeneration in the working plans of Forest Department. 'The research, documentation and database development efforts of RCMPCC with *vaidus* and communities, earned us an honor of "Resource Institution" in the State Medicinal Plant Board and Forest Department' (SE, small group meeting, RCMPCC management board representative, Pune).

The village biologist program and CAMP exercises helped identify unique species from the MPCAs and systematically mounted them for future preservation and botanical assessments. Many healers played important roles as research anchors in scientific studies with state, national and international researchers. 'Our *vaidus* have guided researchers from International Tropical Timber Organization (ITTO), Japan and helped them organize transects by identifying suitable pockets' (workshop, MA, Key leader, RCMPCC). The contributions of local knowledge and its holders were significant in achieving the conservation goals of RCMPCC.

4.4.1.2: Baripada: Improvement in the status of natural resources base

In terms of the changes in the resource status, Baripada Forest Protection Committee members and community leaders monitored and measured the changes on the basis of the availability and use of various local resources, as described in Table 4.6. These responses were collected through personal interviews with the Forest Protection Committee members and community leaders (N=9) and were verified in small group discussions.

Table 4.8: Monitoring of the changes in the resources status as reported by members of the Forest Protection Committee, Baripada

Type of Natural Resource	Status in 1990 (before initiative)	Current Status (2004)
Fuel wood	- Used to be abundant but dwindling at alarming rate. - Dried wood of all plants (trees) removed. - Green twigs/ branches are removed, then cut in small pieces and brought into the village.	- Villagers of Baripada and surrounding six villages are self-sufficient in meeting their fuel wood needs. - Dry woods are removed only in limited quantity. - Green branches are hardly removed for fuel wood.
Surface water within forest	One perennial source, i.e. <i>paniyanu nalu</i>, was used for drinking by cattle/wildlife and miscellaneous human uses.	- A new natural water sources, i.e. <i>Kuchidahr nu nalu</i>, emerged in 2002-3 which provides water until March. - More than 180 small stone dams were erected through community labour or <i>shramdan</i> to check soil erosion.
Surface water availability outside forest	- Village used to get its drinking water from Manjari village (around 3 km) through pump. - The source of water is the gravity suction created through diversion and slopes of surrounding hills. - Agriculture Department constructed 3 check dams in 1986-86.	- Within village there are now 40 water pumps for agriculture. - Two new drinking water pumps of 12.5 hp supply water to Baripada and four neighboring villages for drinking and agricultural purposes. 13 more check dams constructed by Agriculture Department.
Change in trees status (timber)	Plant species like teak (<i>Tectona grandis</i>), <i>Sadad</i> (<i>Terminalia tomentosa</i>) were on decline.	- Population of plants like Teak, <i>Sadad</i>, <i>Dhamda</i> (<i>Anoeissus latifolia</i>), and <i>Kadkuda</i> (<i>Canscora diffusa</i>) have been increased. - Forest departments have planted Bamboo (<i>Bamboosa strictus</i>), Sisam (<i>Dalbergia sissoo</i>) and Kher (<i>Acacia catechu</i>) in 1997-98.
Ground water	Normally found at a depth of 15-20 ft in winter and monsoon and more than 30 ft in summer.	The ground water rose to 7-8 ft in winter, 5-7 ft in monsoon and 10-12 ft in summer.
Wildlife status	Occasional sightings of panthers, <i>Bhekar</i> (deer without horns), termite eaters, rabbits, peacocks, chameleon and monitor lizards.	- Increase in number of panthers. - Hyena is stable. Sighting of <i>Bhekar</i> termite eaters, rabbits, peacocks have increased. Chameleon numbers increased and now seen in village, too.

Table 4.8 indicates how community protection over the last ten years has resulted in improvement in the availability of resources like fuel wood, fodder and surface/ground water in Baripada. In fact, fuel wood and water were the main resources for which the goals of conservation were targeted. In addition, there has been a positive increase in the sightings of naturally occurring wildlife and local plants within the forest.

After the initial success of the conservation of the village forest, villagers realized the need for continuous monitoring of plant diversity within the forest. In September 2004, with the help of local healers, the Forest Protection Committee members, representatives of Janseva Foundation and college teachers from Pimpalner and Sakri town created the first plant diversity register. This register enlisted the local names of all dominant species from 14 different sites capturing the geographical variations. Some simple rules for the use of the information provided in the community register were also formed. The villagers of Baripada have decided to update the plant information in the register and monitor the status of plant diversity every two years.

4.4.2: Human well-being

The community-developed indicators for measuring human well-being included reduction in poverty, local initiatives for health improvement (home herbal garden), empowerment of women members, enhancing local capacities for biodiversity monitoring, and indicators for leading to increase in income (e.g. change in cropping pattern). The following two sub-sections describe human well-being outcomes for the two CBC initiatives from each community's perspective.

4.4.2.1: Rural Commune's Medicinal Plant Conservation Center: Improved access and women's empowerment

'If poverty is viewed as a scarcity of resources and technologies to meet basic health needs, then efforts of the RCMPCC have contributed to reduction of poverty through revival and use of local health traditions or TMK, particularly in those regions which are economically poor, isolated and deprived of adequate modern medical facilities' (personal interview, MA, key person, RCMPCC).

The establishment of seven nurseries, 11 demonstration gardens, four nature trails and six home-herbal gardens has improved local community's access to medicinal plants which were otherwise only found in reserved forest areas that are restricted and do not allow public access. Identification and recognition of 415 local healers, compilation of data on medicinal properties and local uses on 326 plants, development of a database on unique treatments of 265 illnesses covering 175 plants from Melghat MPCA and 68 plants from Toranmaal MPCAs, were some efforts targeted to enhance the use of local medicinal plant knowledge in the region.

The initiative also resulted in improving the status and the participation of women in economic development activities. Their own skills and knowledge were substantially used in the preparation, processing, and sale of medicinal plants (RCMPCC, 2003; Shukla, 2004).

Another benefit to local communities was the organization and empowerment of the village women in the form of the more than 30 women self-help groups in the nine MPCAs. The self-help groups have provided unique opportunities and exposure to many illiterate and economically poor village women to engage in income-generating activities, such as herbal drugs collection, processing, and marketing. Most of the self-help groups have registered the profits, in some cases three to four times more than their initial investment funds.

'Our participation in various RCMPCC activities in general and in self-help groups in particular, gave us a visible identity and voice in the village. Now we are regarded important stakeholders in village development activities including conservation and in local medicinal plants and consulted by *panchayat* members and government department officials in decision-making' (personal interview, self-help group member, Amboli).

Participation of women *vaidus* in these programs has helped in improving their recognition in the village.

‘In the past, our expertise was limited to midwifery skills. But now we also treat people as male *vaidus* do. Besides, our participation in programs like *vaidu sammelan* gives us a confidence and authority to take part in village conservation and development activities related to medicinal plants along with male *vaidus*’ (personal interview, JS, women *vaidu*, Amboli).

The women *vaidus* in particular and *vaidus* in general are being regarded as equal partners, not only in generating a useful knowledge base about medicinal plants, but also in developing an agenda for their conservation and sustainable use.

The empowerment of village women in MPCAs was also considered as a major outcome by independent reviewers who study impacts of RCMPCC initiatives. The participation of women healers with male healers was something new to the village. The women healers are few in number; their skills are considered limited to pregnancy and cattle diseases. In this case, these women healers have transcended this perceived boundary and helped in sharing the conservation and development agenda at local level.

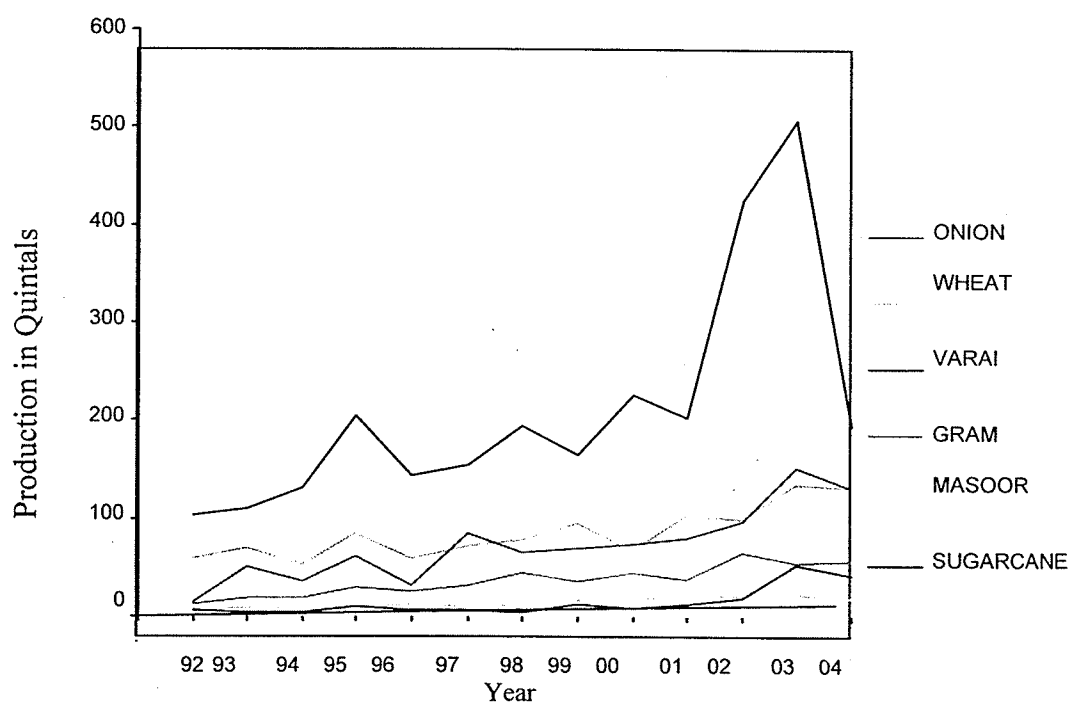
4.4.2.2: Baripada: Improvement in agricultural area, production, women participation in economic development and access to irrigated land

The major livelihood activity of the Baripada village has been farming. Agriculture production, therefore, can be considered one of the important indicators for standard of living in the village. The steady increase in the production of major agricultural crops is a signal of improvements in production. According to Baripada community leaders and the Forest Protection Committee members (focus group discussion), three other major positive changes in agriculture of the village could be attributed to positive effects of local conservation: a) change in the cropping pattern with an inclusion of cash crops to generate additional income; b) change in total agricultural production; and c) change in the area under irrigated farming. Household surveys were conducted to collect data on crop production (Figures 4.4 and 4.5) and land holding (Table 4.9). These data were then verified by village elders and field staff of Jan Seva Foundation in focus groups. The Janseva Foundation has been compiling village-wise information in their project villages

(including Baripada) since 2000. Finally, the revised data were cross-checked with the village-level estimates of derived from block-level aggregated data available from Forest and Agricultural Departments.

The changes in cropping patterns can be seen in Figure 4.4, which provides data on production of newly introduced crops like onion, sugarcane, monsoon *varai* (hill millet), grams, *masoor* (a local variety of lentil) and sugarcane. Crops like onion and sugarcane are cash crops and have been grown not only for local consumption but for commercial profit from sales to traders outside the village. The increasing preference for sugarcane can be attributed to the production of jaggery within a village after the jaggery-making unit was installed from the award money from the State Forest Department.

Figure 4.4: Growth in the production of certain new and commercial crops

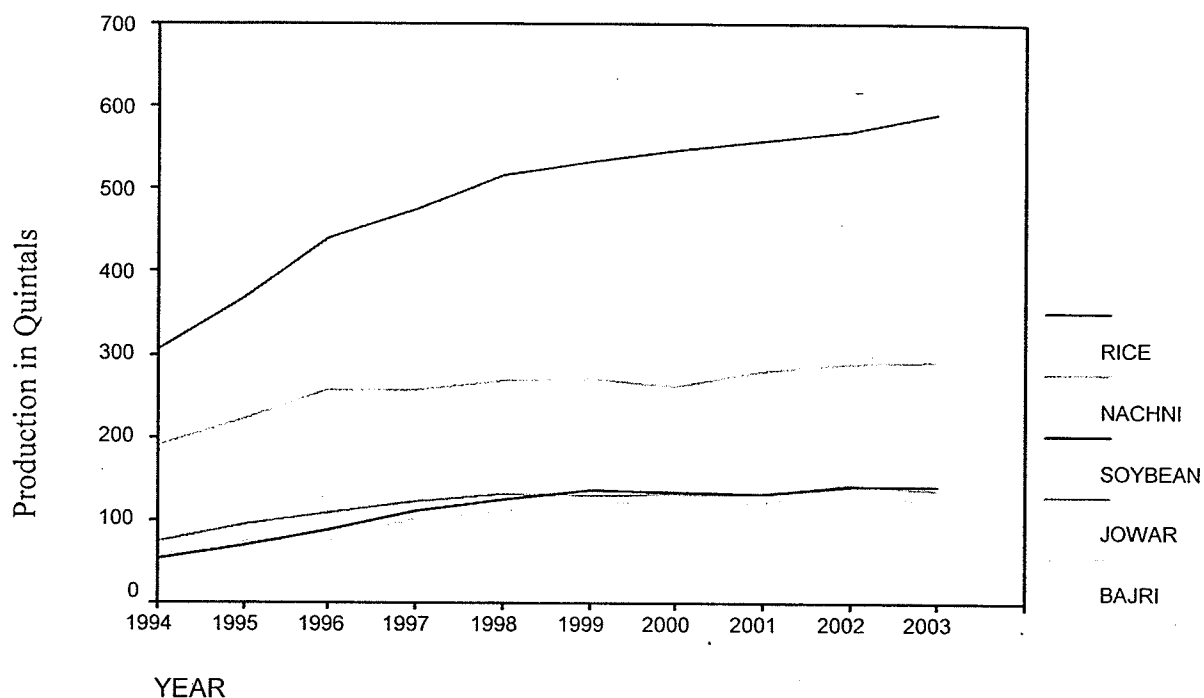


Source: Baripada household survey data, October 2004

The reason for a decline in area and therefore less production for cash crops like sugarcane and onion were due to preference by local growers due to poor market return in the year 2002 and 2003. The second indicator for improvement in economic well-being

is the increased production of main crops that have been grown conventionally. The production of main crops has steadily increased since 1994, as shown in Figure 4.5.

Figure 4.5: Changes in the production of main crops



Source: Baripada household survey data, October 2004.

The reasons for increased production in staple crops such as rice and *nachni* were: a) introduction of crop improvement programs by NGOs such as Janseva Foundation, and b) increased local demand, production and marketing of new processed products such as *nachni* (*Eleusine coracana*) *papad* or *nachni laddu*. The *nachni papad* making activities started by the women self-help group of Baripada have become very popular in and around Baripada, particularly in urban towns of Sakri and Pimpalner. Pearl millet has mainly been used as a staple, particularly as a replacement for wheat to make bread (*roties*). Surplus is then sold in the weekly market for additional income. While most of these main crops are used as staples, the villagers have been benefiting from additional income since 1996-97, when additional water for agriculture became available because of improved forest cover and prevention of run-off loss through community-built small

stone dams. The agricultural production in Baripada was further boosted through systematic efforts initiated by NGO like Janseva Foundation.

Table 4.9: *Improvement in irrigated land holding in Baripada*

Community groups/ Year	Land holding in hectares		
	Before 1990	1995	2004
Pawar	25	28	36
Chaure	8	13	22
Chudahary	14	22	24
Bhoye	7	17	28
Bagul	12	18	22
TOTAL	66	98	132

Source: Baripada household survey data, October 2004

‘There have been marked improvements in the availability of surface and ground water which helped in increasing agricultural land holding for various community groups. The water availability more than doubled in last fifteen years’ (personal interview, CP, key leader). The area under water-intensive cash crops like sugarcane and onion were also increased due to this improved water availability in village (see Table 4.9).

The participation of village women in economic development activities also increased. The improvement in the family income led to establishment of two self-help groups. The first is engaged in production and sale of local products such as *nachni* papad. The other self-help group is a micro credit group which promotes savings among women members. Many women members from both self-help groups had the opportunity to participate in orientation and training program organized by Janseva Foundation or Vanwasi Kalyan Ashram in the district. ‘These self-help groups have provided opportunity to connect with other self-help groups, community-based organizations and NGOs around village, and contributed to learning about new ideas and various activities of other self-help groups’ (personal interview, VP, self-help group president, Baripada). Village healers and community leaders also played an important role in identification of sites for vegetation mapping and recording of ethnobotanical information about the local plants as part of preparation for the plant diversity register. ‘When we work with teachers and botanists from college, we felt that our knowledge about plants is not only locally useful but also

valued in conservation of our own resources' (personal interview, BP, local healer, Baripada). Improvement in agricultural production, access to irrigated land, changing preferences for cash crops and participation of women in economic decision making were major human well-being outcomes in Baripada.

4.5: Chapter summary and discussion

The enabling conditions recognized through self-organization and cross-scale linkages in two CBC initiatives in the western State of Maharashtra are summarized in Table 4.6. The self-organizational aspect was studied through their sources, triggers and catalysts, mobilization of human and financial resources, use of multiple sources of knowledge and adaptive learning. The cross-scale linkages of these initiatives were represented by multiple stakeholders networked through vertical and horizontal linkages. These linkages, or partnerships, were driven by the relative strengths of key stakeholders such as their technical or local knowledge, infrastructure or expertise in training.

In terms of self-organization, the strategies used by both initiatives correspond to the ones reported by other studies. For instance, for an externally-inspired, state-wide initiative like RCMPCC the motivation came through as UNDP supported conservation project in India, while the Baripada self-inspired initiative was triggered by ecological hardship (reduced ground and surface water, reduced fodder and fuel wood) caused by indiscriminate cutting of teak trees by outsiders. These patterns of motivation were also reported in earlier studies in India (Pathak et al., 2005) and elsewhere (Seixas et al., 2005; Seixas et al., 2006).

The RCMPCC initiative can thus be seen as an opportunity to capitalize on international funding rather than response to crisis, as in the case of Baripada. Notably, the common initial strategies for encouraging self-organization used in both cases was a series of consultations with key stakeholders (orientation workshops in RCMPCC and consensus building in Baripada) by the leaders or key persons associated with the initiatives. Frequent organization of local workshops and meetings with key partners in the initial

stage also seems to be a common strategy in several CBC initiatives from equatorial region (Berkes & Seixas, 2004; Seixas et al., 2005). Central to this self-organization was the role of leaders as catalysts in both initiatives.

Experiential learning from successful replication of CBC models demonstrated by FRLHT in southern India provided the vision for RCMPCC initiative. The leaders of FRLHT and RCMPCC thus shared and implemented the common vision of community-based medicinal plant conservation. In addition, the positive attitude, motivation and interests of the senior State Forest Department officials helped in transferring this vision into concrete action in early stages implementation. In Baripada, local leaders acted as a catalyst to organize villagers, who were looking for a way out of an ecological hardship. Community leaders in Baripada have also shown leadership skills in working with a range of stakeholders, creating a local institutional response and conflict management. The negotiation and networking leadership features as demonstrated by both cases match with 'leader as a bridge builder' and catalyst as identified in study of leadership characteristics of five CBC initiatives (Timmer, 2004) from the equatorial region and CBC initiative of wetland management from Sweden (Olsson et al., 2004), respectively. However, 'leader as visionary' as exemplified by RCMPCC initiative is a relatively less highlighted feature in many studies barring few exceptions such as the CBC study of oyster management from Brazil (Medeiros, 2004).

A related aspect of leadership is adaptive learning or adaptation of rules and leaders managing CBC initiatives, particularly at the local level. In general, these changes were driven by new experiences (replacing dysfunctional members from the local management committee/self-help group in Amboli MPCA), new management situations (relaxation of community rules for special needs and occasions in Baripada) or mandated by statutory requirements (appointing the village forester as a secretary of the local management committee in case of RCMPCC and of the Forest Protection Committee in case of Baripada). The key persons associated with management of the RCMPCC initiative were shuffled in some MPCAs including Amboli, due to administrative (end-of-appointment term by a senior Forest officer who was working as a project director, and relocation of

Forest staff at the district and sub-district levels), practical (replacement of dysfunctional presidents of the local management committee/self-help groups on community demands) or political (balancing interest of different caste groups within the village) reasons. These examples of adaptations in leadership corroborate with examples of adaptations in governance for community-based eco-tourism initiative in Peru (Herrera, 2006) and rotational leadership roles in CBC for oyster management from Brazil (Medeiros, 2004).

Such changes in the local leadership of the Forest Protection Committee did not take place in Baripada, perhaps due to the smaller jurisdictional and geographical scale (village level), relatively homogenous social composition and therefore less transaction costs (smooth negotiation among same caste groups) as compared to a state-wide initiative of RCMPPCC with three dominant heterogeneous social groups. A unique feature of adaptive learning exhibited by Baripada, perhaps as a result of consistent leadership, was community-crafted rules for access and use of natural resources; in other words boundary rules, coupled with enforcement of conflict-resolution rules for the breach of boundary rules. Local villagers of Baripada have redesigned these rules and engaged in constant experimentation to implement 'local conservation with human touch' (AP, key originator of Baripada initiative, personal interview, September, 2004). These features of adaptive learning were considered very useful in self-organization and durability of CBC initiative and similar to the 'learning by doing approach' in complex social-ecological system as advocated by conservation scholars (Anderies et al., 2004; Gunderson & Holling, 2002, Levin, 1998)

Table 4.10: Self-organization and cross-scale linkages in MPCC and Baripada

Categories	RCMPCC	Baripada
Sources	a) Inspired by NGO and international donor	a) Inspired by community leadership
Triggers and catalysts	a) Replication of successful model by leaders b) International funding c) Favorable response by Forest Department d) Series of orientation workshops	a) Community's willingness to act against over extraction of forests for livelihood needs b) Series of consensus building meetings by leaders c) local leaders as catalysts
Human resource mobilization	a) In-kind (vehicles, land, construction of MPCA) with support from Forest Department b) Local NGOs support for training of local management structures	a) Exposure tours and local training by NGO, b) Sensitizing schools & children towards conservation c) Use of local gatherings (sports, flea markets) to communicate conservation rules
Funding	a) Large international funding b) Use of awards to empower local management structures through revolving funds c) State/NGOs funding in capacity building	a) Token funding from villagers to pay watchmen, b) Little support by NGO in exposure tours and training c) Awards money from State used to create village level assets for further income generation
Knowledge	a) Use and exchange of codified (local), uncodified (from local healers) and scientific knowledge (botanists, scientists, NGOs, foresters) b) Women's knowledge recognized through village biologists and self-help group	a) Local knowledge of healers used in mapping for monitoring and plant register b) Community leaders' knowledge used for crafting and revising conservation rules c) Scientific knowledge from universities/NGOs for Agricultural development
Management	a) Structured management bodies at state, district, sub-district level as per guideline b) Government notification from Forest Department for the MPCA at the start	a) Village Forest Protection Committee with Forester as secretary, now (bottom-up) b) Formalized under Joint Forest Management later.
Adaptive learning	a) Changes in structures and functions of the management structures b) Change in training strategies by RCMPCC c) Reshuffling of roles of key leaders d) Integration of strategies by Forest Department e) Boundary and conflict resolution mechanisms were fuzzy in beginning but evolving	a) Changes in community-crafted rules to accommodate new experiences/ needs b) Spinning-off of local NGO c) Changes in local structure and function d) Clearly communicated Boundary and Conflict resolution mechanisms
Vertical linkages	a) NGO with state and district Forest Department b) NGO with Local management structures and specific target groups such as healers & women c) NGO with MoEF and UNDP	a) Not so visible and established by horizontal linkage b) The most visible vertical link is between the Forest Protection Committee with Range Forest office & local NGO. c) No significant state or national links.
Horizontal linkages	a) Local management committee/self-help group with Range Forest office b) Among local management committees/self-help groups c) RCMPCC with RC, NGOs & State and District Forest Department	a) Local leaders with the Forest Protection Committee b) The Forest Protection Committee with local NGO c) Village youth association with the Forest Protection Committee
Evaluation of outcomes	a) Conservation of RET medicinal plant species as captured in MPCA b) Revitalization of local knowledge and health traditions c) Recognition and empowerment of local healers and women d) Local monitoring and protection initiatives	a) Conservation of village Forest b) Ensuring Sustainability of eco-system services from the Forest (ground water, fodder, fuel wood) c) Improvement in crop production and irrigated land d) Women participation in economic decision making e) Community plant diversity register

Financial and human resources were mobilized in both initiatives in varying degree. The RCMPCC initiative, even after getting a major funding boost, relied on the Forest Department's in-kind support in the form of the use of its local staff, vehicles, and land. The Baripada initiative, in contrast, depended more on a villager's own cooperation and efforts (in crafting rules for protection, determining areas that required stricter vigilance) with very little financial contribution. The differences in requirement of financial resources vis-à-vis human resources in the self-initiated Baripada initiative and externally-inspired and aided RCMPCC initiative correspond to the earlier findings (Seixas et al., 2005). This research along with a few other studies (Senyk, 2006) confirms that funds need not be a major issue in organizing an initiative, if it is self-evolved, threats to livelihood and local natural resources are imminent, and communities themselves are involved in designing the response. In contrast, many internationally inspired and recognized CBC initiatives (including the Equator Initiative) funds were needed at the start and also afterwards (Seixas et al., 2005).

Strategies ensuring long-term availabilities of funds at the local level (setting aside revolving funds capital in Amboli and generating assets for revenues in Baripada) indicate that the use of funds has been viewed equally important by local communities of both initiatives, as mobilization of funds. The use of funds in RCMPCC initiative for research, product development training, and capacity building at the local level is consistent with the fund use patterns found in other studies (Maurice, 2004; Seixas et al., 2005, Medeiros, 2004). The most remarkable strategies for the use of funds was ensuring financial sustainability through various mechanisms such as empowerment of local management structures by disbursing revolving funds (as in the case of RCMPCC) and creating common assets, such as establishing jaggery units or buying and renting out utensils to neighboring villages (as in the case of Baripada). The NGO's support was also mobilized to build local capacities either through training of local management structures (the local management committee/self-help groups) in RCMPCC or exposure tours for community leaders as in the case of Baripada. The conscious efforts to create such a long-term vision for sustainability of financial resources through creation of innovative local mechanisms such as revolving funds by RCMPCC are noteworthy and reported in

very few CBC examples such as Pred Nai village-based money saving group created as part of the community-based mangrove forest management (Senyk, 2006).

Both initiatives have relied on multiple sources of knowledge, but most importantly local knowledge. In RCMPCC, Ayurvedic knowledge was used initially for making herbal formulations. These formulations were later examined through the folk knowledge of healers and women for local adaptations in Amboli and other MPCAs. It also recognized the potential of local healers' knowledge. RCMPCC recognized local healers as 'village biologists' and provided opportunities for mutual strengthening of skills and knowledge with formally-trained field botanists and ecologists in the MPCA level biodiversity assessment and management.

The Baripada initiative, however, sought active involvement and participation of village healers and their TEK in vegetation mapping for monitoring through the community-based plant diversity register. In both initiatives, a conscious attempt to create a platform for promoting exchange between TEK of village healers and formal knowledge of scientists/botanists was made. RCMPCC (through its programs like village biologist, CAMP, healers' workshops and collaborative cataloguing of medicinal plants) and Baripada (through community-plant diversity register program) have sought to generate and integrate learning from local and formal knowledge for effective conservation of local biodiversity. The use of local medicinal plant knowledge and its holders (local healers and community leaders) by both initiatives for mutual capacity building is a feature of successful CBC, as exemplified by several CBC initiatives (Goldman, 2003; Seixas et al., 2005; Senyk, 2006). In addition, both these initiatives have created and used innovative 'platforms' such as the village biologist program, healers convention and plant diversity register to promote exchange of TEK and environmental education to achieve CBC. A different set of platforms was also used and reported in some CBC initiatives such as the study circle in India (Kotahri et al., 2000), informal learning network in Brazil (Medeiros, 2004) and adaptive co-management committee in Canada and Sweden (Olsson et al., 2004; Kendrick, 2003).

With regard to cross-scale linkages, two types (spatial and jurisdictional) and five levels of scales (village, block or MPCA, state, national and international) were most easily visible in both study initiatives, which are commonly described in CBC literature (Berkes, 2002; Berkes, 2004; Cash et al., 2006). In an externally-inspired RCMPCC initiative, vertical institutional linkages (e.g. RCMPCC with State/Forest Department) were most visible and active right from the beginning of the initiative. Over a period, RCMPCC developed very strong and functional bilateral and horizontal linkages with various stakeholders (Table 4.5), but most importantly with local management committees and self-help groups, which helped in project implementation and capacity building. The presence of strong vertical linkages from national to village levels were considered important by CBC scholars particularly in developing countries like India (Kothari et al., 2000), where support from government is generally weak at all spatial and jurisdictional levels (Gupta, 1999).

In contrast, the self-evolved Baripada initiative has shown very few vertical linkages compared to horizontal linkages, which are more apparent and effective. Further, in the Baripada initiative, there were no persistent and strong vertical linkages at the state or the national level, since most management decisions and functions have been handled through horizontal linkages among stakeholders at the village, sub-state or regional level of the Forest Department. The horizontal networking among the Forest Protection Committee, community leaders, youth associations, self-help groups and local NGO (Janseva Foundation) was the most useful enabling link that helped in the conservation and management of the forest. The role of horizontal actors and linkages among them is more important in a self-evolved CBC initiative than actors and linkages at the vertical level. This finding is illuminating and indicates a potential area of future empirical research to examine the comparative contributions of vertical and horizontal actors and linkages in self-evolved vis-à-vis externally-inspired CBC initiatives. Through vertical linkages, technical support and funding from formal institutions were mobilized in RCMPCC initiative and, to a certain extent, in Baripada initiative. Similar research and technical support from university and formal research institutions was reported in oyster management CBC initiative of Brazil (Medeiros, 2004) and Guyana (Fernandes, 2004).

What is common, however, in both initiatives is the role of NGOs in generating key functional horizontal and vertical linkages. For example, in Baripada initiative the vertical link between the Forest Protection Committee and the Range Forest Office were made clearer through the involvement of local NGOs like the Janseva Foundation, which facilitated negotiations between them. Similarly, in RCMPCC initiative, RCMPCC NGO provided a tandem of support for creating key linkages at the state and regional levels (such as the local management committees, self-help groups, and Range Forest Office at village level and RCMPCC, other NGOs, and Forest Department at the state level). This is in agreement with a study of CBC initiatives by Berkes and Seixas (2004) which pointed out similar role of NGOs in creating such stronger linkages at the state level. Another noteworthy issue on cross-scale linkages is the role of local knowledge as a driver in facilitating certain key bilateral linkages (Table 4.5). This is more strongly demonstrated in RCMPCC initiative where local healers or *vaidus* and their knowledge have produced useful functional outcomes such as conservation and assessment of RET plants at the MPCA level, contributions to Forest Department's management plans at the district and the state levels, and collaboration with research scientists at the national and international levels. The role of village healers in creating and maintaining a plant diversity register, and thereby generating useful horizontal linkages with community leaders, members of youth associations at the village level, and college teachers at district and state levels was significant in the baseline assessment and monitoring of local plants.

The differences in the self-organization strategies and cross-scale linkages of both initiatives may be attributed to the social composition, drivers for the initiatives (self-evolved versus externally-inspired) and to a certain extent their geographical scales. Baripada is a village-based, self-inspired initiative by a homogenous social group, while the RCMPCC is an externally-supported and state-wide initiative with multiple stakeholders and social groups. The stronger linkages between Amboli MPCA and its local structures with RCMPCC and local NGOs and the Baripada Forest Protection Committee indicate that participation of village level communities and their closer interactions with the implementation agencies at the higher levels are important ingredients for promoting self-organization and cross-scale linkages.

Successful self-organization and cross-scale linkages of these CBC initiatives resulted in achievement regarding conservation and human well-being outcomes. The conservation achievements of RCMPCC could be judged on two main outcomes: a) conservation of medicinal plant species within MPCAs including RET (rare, endangered and threatened) categories; and, b) strengthening capacities of local management structures and village healers to conduct and periodically monitor the status of local medicinal plants through programs like CAMP and village biologists. In a few MPCAs, however, the members of the local management committee along with Forest Department, have engaged in joint monitoring and prevented illegal extraction of high-valued medicinal plants, as indicated by the examples in Section 4.4.1.1. In addition, institutionalization of conservation strategies such as CAMP, MPCAs by Forest Department at the state and district levels (integrating in their management and working plans) and the planning commission of India could be considered as a notable achievement of the RCMPCC initiative, particularly in exerting influence on national and state conservation planning.

The Baripada initiative, on the other hand considered, its conservation achievement in terms of regaining ecosystem services from the forest (improvement in the status of ground and surface water, fuel wood and fodder), which were perceived as threatened at one time. The increase in naturally occurring plant and wildlife species were reported by Baripada communities. The locally-designed and enforced rules for conservation of forest were the key factor in improving the conservation status. The community-based register emerged after a decade of conservation and helped assess baseline plant diversity, reflecting the community's commitment to monitor the result of their conservation efforts.

In regards to human well-being, aside from income generation by local management structures such as the local management committee/self-help group (RCMPCC) and improved agricultural productivity (Baripada), non-monetary benefits were also found useful by local communities. These include revitalization of local knowledge, local health traditions and, most importantly, empowerment of village healers and women. In both CBC initiatives, village women were organized into self-help groups and became an

important stakeholder in decision-making in the local management committee and the Forest Protection Committee.

Finally, the most common and critical factor to success that cut across the self-organization strategies, cross-scale linkages and related outcomes in both initiatives was the role of local knowledge. The knowledge, contributions and participation of *vaidus* or village biologists or local healers in local conservation and development activities were significantly acknowledged and used to meet CBC goals. The availability and acceptability of *vaidus* at the village level and their legitimacy, recognition and partnerships at the state and national levels, created a sense of empowerment (that they can decide and implement the local conservation and development agenda) and equity (that their knowledge can inform and interact with knowledge of formally trained botanists or foresters). Such a use of local knowledge as empowerment is one of the most sought-after condition (Berkes, 2004) or challenges to effective implementation of CBC (Brown, 2003).

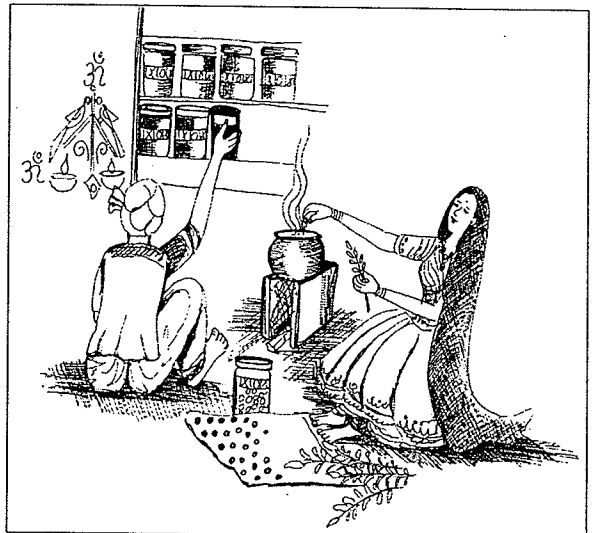
Both these CBC initiatives have also shown a lot of promise in moving towards creating fusion knowledge (Blaike et al., 1997; Brown, 2003) through educational approaches such as the village biologist program, local healer's conventions and plant diversity register. However, the risks of under-representation and misrepresentation of TEK in CBC during such fusion or integration are also well known (Section 2.2.), which can be avoided if the in situ generation and transmission mechanisms of local knowledge are known and facilitated. In other words, understanding of the learning mechanisms or transmission of TEK (Berkes, 1999) can potentially provide better clues to enhance the outcomes of both types of CBC initiatives : i) those in which the use of TEK is already evident (RCMPCC and Baripada); and ii) those potential ones in which the use of TEK has never been explored. In addition, understanding the transmission of local knowledge can also partly fulfill the requirement of the second strand of learning approach (Keen & Mahanty, 2006), which is learning from and reflecting within the local knowledge communities.

Chapter 5:

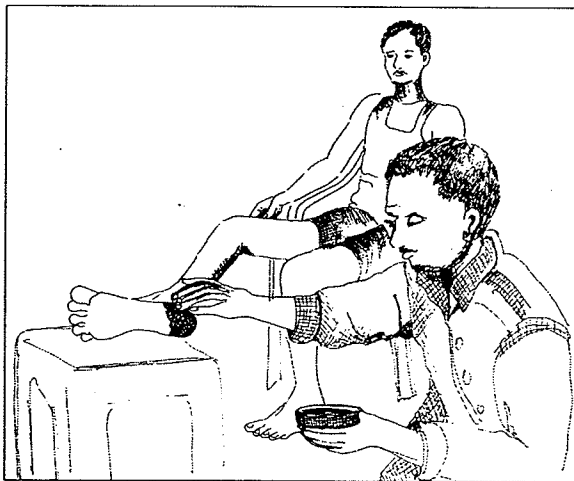
Transmission of traditional medicinal plant knowledge



Consultation with patients



Processing of herbal medicines



Application of herbal medicine



Discussion with other healers about rare plants is important skill practiced by local healers

CHAPTER 5: TRANSMISSION OF LOCAL KNOWLEDGE FOR COMMUNITY-BASED CONSERVATION

The literature on community-based conservation (CBC) as outlined in Chapter 2 and the results presented in Chapter 4 establish the importance of tapping into and promoting local knowledge for successful CBC outcomes. As established through looking at the use of TEK in Amboli and Baripada, the knowledge of local healers and villagers about local plants played an important role in three key areas. Firstly, this knowledge plays a role through the self-organization of key partners by strengthening their mutual capacities. Secondly, through generation of useful learning and linkages among various actors in RCMPCC (such as a published database of healers at the district level, and healers as research anchors in collaborative research studies commissioned by state/national research institutions). Thirdly, this knowledge plays a role through the achievement of two goals of biodiversity conservation, the first goal being the use of healers in the assessment and monitoring of medicinal plants in RCMPCC through village biologists and CAMP programs; the second goal being the creation of a plant diversity register for baseline assessment and monitoring of village forest resources and of human-well-being in Baripada.

For TEK to be successful, and for it to contribute in a meaningful way to CBC, transmission must take place. In fact, many scholars believe that it is critical to understand how local knowledge is acquired, transmitted, and adapted in order to understand the knowledge itself (Zarger, 2000). As well, CBC scholars (see Figure 2.1 as proposed by Berkes, 1999; Folke et al., 1998) have further established that intergenerational transmission is one of the important social mechanisms for survival, use and internalization of TEK in the community context. This chapter therefore deals with understanding of the transmission of traditional medicinal plant knowledge (TMK), an important type of TEK revealed in the case studies and a critical component of learning, as stated in the second research objective. It also examines the potential of such learning in promoting CBC outcomes. Such research is also an important component of the

learning approach to sustainable natural resources management as identified in Section 2.1.1.

5.1: Studying traditional medicinal plant knowledge

The World Health Organization (WHO) recognizes traditional medicinal plant knowledge (TMK) as a traditional system of medicine and defines it as ‘the diverse health practices, approaches, knowledge and beliefs incorporating mainly plants and plant products with or without spiritual therapies, transmitted through generations by oral means to maintain well-being, as well as to treat, diagnose or prevent illness’ (WHO, 2002, p. 1). Transmission here refers to a transfer of skills from old healers to young healers (Ohmagari & Berkes, 1997). It is a process of acquisition of skills, personality traits and values by younger healers in order to become mature healers who can independently practise TMK.

In this research, the focus is on the identification of skills central to TMK, and how those skills are acquired or transmitted. Such a consideration was placed on skills for the following reasons: i) a need for examining the practice-oriented aspects of TEK as expressed by earlier studies on transmission (Ruddle and Chesterfield, 1977) and subsequent studies (Hewlett & Cavalli-Sforza, 1986; Ohmagari & Berkes, 1997; Ruddle, 1993; Tsuji, 1996), which all considered ‘skill’ as the practice-oriented aspect of TEK in intergenerational transmission ; ii) while this research is aware that local knowledge systems such as TEK are dynamic and cumulative (Berkes, 1999), it also supports the view that distribution and accessibility of TEK can be unequal at the community level (Gupta & Sinha, 2002; Vanderbroek et al., 2004). This is particularly true in the case of TMK, in which medicinal and edible plants may not be known by many members of the village community, rather its processing, application and treatment is known and practiced¹⁴ by local healers having specialized skills (Shankar, 1999). Such specialized

¹⁴ Community members from the village may have some knowledge of medicinal plants therefore they are referred to as TMK holders. The local healers on the other hand are referred to as TMK practitioners who are also TMK holders, but with specialized skills in using medicinal plants as established through their practice.

skills of TMK are the type of knowledge with restricted access and distribution among local healers, mostly inherited from previous generations without much modification (Haarumaya, 2003b). This is in contrast to the local knowledge 'derived' or adapted from inherited knowledge. The research followed this direction with a focus on the TMK skills, which are generic, known and practiced by local healers and often do not change with intergenerational transmission. This direction of research was shared and reconfirmed through local healers during the inception workshops.

In this study, the local healers or *vaidus* were identified mainly on the basis of following criteria: a) a person who is a resident of the village; b) a person who has demonstrated ability/skills to practise his/her knowledge of healers in and around the village; c) a person who has been recognized by local residents and/or neighboring villages as a general or specialized *vaidus*; and d) a person who played some role or had shown interest in local conservation efforts (e.g. participation in RCMPCC or Baripada initiatives). A preliminary list of 46 local healers (N=22 from Amboli, N=24 from Baripada) was prepared by applying these criteria in consultation with local NGOs (RCMPCC and Baripada forest protection committee members). In the end, 33 of the 46 healers identified (N=16 from Amboli, N=17 from Baripada) were available and willing to participate in the study. Of the 33, 15 (N=7 from Amboli, N= 8 from Baripada) were women. All healers from Baripada were from the scheduled tribes (locally known as *adivasies*) category, while the majorities (three-quarters) from Amboli were from the Maratha or higher caste category.

After selecting the healers, data on skills were obtained first through informal and then through semi-structured interviews. Informal interviews were conducted during forest walks with the healers, who were mainly asked to provide responses to the open-ended question: What skills are crucial to become successful healer? After pilot testing this with five healers from each village, it was realized that being a successful practicing healer required two characteristics: a) the personality traits, qualities or values that *vaidus* should possess; and, b) the set of skills that represented knowledge, which are mostly observable and perceived important by the elder healers.

The informal conversation with healers during forest walk and participant observations of some practising healers yielded 33 statements describing various skills (see column, 2, Table 5.1). This list was then shared with healers in the focus group which helped in categorizing and consolidating these statements into a final set of the ten most important skills. This was followed by semi-structured interviews with all 33 village healers using a checklist. This checklist (Appendix C) helped in obtaining data on sources and methods of learning TMK, factors influencing loss of TMK, as well as the ranking of these ten crucial skills.

5.2: Identification of Crucial skills to become TMK practitioner

The set of ten crucial skills identified by local healers through interviews and focus groups is presented in Table 5.1. During the semi-structured interviews, healers were asked to assign scores to these skills in order of importance. Such an exercise was conducted for two reasons: i) to examine whether the skills which were valued high can help achieve the goals of CBC ; and ii) to assess the difference between young and old healers in terms of the relative importance they attached to crucial skills, as an indirect measure of which skills are vulnerable to being lost. These skills were scored on the basis of a three-point rating scale: a) most important (scored as 3), important (scored as 2) and least important (scored as 1). The average scores for each of ten crucial skills were analyzed using SPSS (V 13.1) and discussed with the healers in a small groups where they verified and finally categorized the skills into the same order of importance (Table 5.1). However, the average score and ranking is typically ordinal and only indicative of relative importance to these skills ascribed by healers. In other words, a score of 3 is greater than 2 and 1, but the difference between 2 and 3 can not be compared with the difference between 1 and 2. In addition, all ten generic skills were considered important and mutually supportive (not exclusive) by local healers. Aspiring healers or learners must acquire all at various stages of life. Therefore, acquiring the only skills that healers ranked highly would not make someone a good healer. The list of crucial skills, age at which they were acquired, and their importance based on ranking by healers from both field sites, is presented in Table 5.1.

Table 5.1: *Crucial skills to become successful healers as identified by local healers*

Name of Skills	Description of Skill / sub-set of skills	Mean Age at which skill was acquired (N=33)	Ranking of skills in terms of importance (N=33)
Identification	• Identification of rare plants • Identification of poisonous plants • Distinguishing phenotypically similar plants	16.7	Most important
Knowledge of plant becoming rare	• Name and location of rare plant species • Marking location of rare plant species for other healers • Spreading awareness for regeneration/sustainable use/safer harvesting of rare plants	20.6	Most important
Interest in plants	• Developing sensitivity towards local biodiversity • Showing a desire to learn about plants • Curiosity to learn about plants	15.1	Most important
Harvesting of plants	• Part and quantity to be removed • Method of harvesting • Time of removal (specific day and time, e.g. planetary movements) • Special care/rules for harvesting to be taken • Religious rituals to be performed during harvesting	18.6	Most important
Processing of plants	• Part / parts and quantity to be used • Method of preparation (mixture, decoction, etc) • Storage of raw material and/or final product	19.1	Important
Consultation	• Personal rapport with patients • Instructions for repeat treatment • Special care while dealing with serious illnesses, children and women • Getting feedback through dialogue with patients	19.1	Important
Habitat of Plant	• Knowledge of places/locations in and around villages • Knowledge of geographical features as indicators of particular habitat • Knowledge of use of landmarks/special symbols/signals to relocate/indicate use/overuse of the plant	16.5	Important
Application	• Number, length and interval of dosages • Quantities to be used in each dosage • Religious ceremonies to be performed during application • Knowledge of side effects/counter indications	19.0	Important
Evaluation of treatment	• Checking the efficacy of treatment through written record or dialogue with patients • Network with other healers to assess relative importance of various treatments • Checking effect of treatment through physical examination	19.6	Least important
Follow-up	• Continuous contacts with patients through personal contacts/consultations/informal meetings • Referral to other healers	19.9	Least important

5.2.1: Identification of plants

Identification of plants is the top on the list of most important skills to become a good healer as perceived by the *vaidus* from both the villages. Identification of plants is mostly learned in the wild or forest areas or in some cases, in specially created areas such as home herbal gardens (Baripada) or village demonstration gardens (Amboli). In some cases, identification is also taught at the homes where the plants are cut and stored. The skill of identification consists of three sub-skills: a) identification of poisonous plants; b) identification of rare plants; and c) identification and differentiation among plants with similar appearances. There are variations in the methods of teaching identification. For example, 'My father used to keep four to five branches in front of me, and then asked me to pick the right one by calling out their names' (personal interview, JY, Amboli). This kind of guided and practical teaching helped in not just identifying the right plants, but also differentiating the medicinal uses of plants with similar appearances. In a few cases, these skills were learned during visits to the forest as part of daily routines, including cattle grazing.

Some healers have also suggested that seemingly alike plants should be identified based on a step-wise test. One should begin to look at the color of the leaves. If the colors of two leaves are the same, then look for the shapes of leaves. If the shapes are the same, then crush the leaves and stem bark and smell. Most plants have distinct smell, but, even if one is confused with similar smells, then the final criterion should be to check for the type, shape, size and smell of flowers and fruits. Most healers, however, strongly believe that identification of poisonous plants must be taught. 'Plants, for example like *Bhuykuli* has potential to kill even human beings if eaten in a small quantity. Therefore, young healers must know to recognize such plants in wild' (personal interview, MC, Baripada). Even mere smelling or a little tasting of such plants could be dangerous. The correct identification is a key to avoid harmful effects of such plants when used in the treatment. Identification of rare plants is also considered an important sub-skill in order not to remove them inadvertently while picking other medicinal plants from the wild. Even though the mean age of acquiring the identification skills is close to 17 years, it is being learned and taught throughout healers' lives.

5.2.2: Knowledge of rare and locally unavailable plants

The knowledge of the rare and locally unavailable plants is the second important skill. The sub-set of skills that constitute this skill complex is: a) name and location of the rare or locally unavailable plants; b) marking location of rare plants with specific symbols; and c) spreading awareness for safer extraction and regeneration of the rare plants.

Learning about the name and location of rare medicinal plants occurs partially during acquisition of identification skills. During interviews, the healers indicated a variety of medicinal plants which they thought were becoming rare. Special efforts were made by healers to teach about rare plants to young learners once the learners were well-acquainted with common plants. 'Since finding such plant requires a good idea of identification and habitat, we teach about the local rare plants once the young learners can independently identify and use common medicinal plants' (personal interview, LP, Amboli). Some local healers have to travel long distances in search of certain plants. In Baripada for example, more than half the healers walk more than 20 km on an average to locate a locally rare but very useful plant called *Ragatrohida*. 'I sometimes make a bus trip to the town of Ahwa, 60 km away, in the neighboring state of Gujarat. I then walk with my friends to bring *Ragatrohida* bark from forests' (personal interview, SC, Baripada). In fact, discussion about rare plants and their locations is one of the five most discussed topics within the network of the local healers.

Marking of rare plants and their locations through landmarks or specific identifiable symbols is practised by one-third of the healers from both sites. While the remaining two-thirds have not used such marking, they do acknowledge that marking the location of rare plants is an important skill. 'I put a one rupee coin, *kanku* (red colored powder) and few grains of rice near a rare plant so that other healers might notice it as already used plants. Such marking also protects rare plants from overextraction' (personal interview, RB, Baripada).

Nearly half the healers have cited wrongful and destructive methods of harvesting (by healers, villagers and outsiders) as the main cause of local plants becoming rare.

We are almost on the verge of extinction of *Amruta* plant because its anti-cancer properties were discovered by a few pharmaceutical companies, and some of the plant collectors from outside villages have been indiscriminately chopping this valuable species from our forest. As elders, we must teach younger healers to protect such destructive actions through village-based monitoring and local regeneration (personal interview, LGG, Amboli).

In Amboli, because of organized efforts by RCMPCC, forest nurseries within the village have been established. The healers of Amboli, therefore, have indicated forest nurseries and MPCA as preferred sites for regeneration of local plants. In Baripada, more than one-third of the local healers set up loosely structured home herbal gardens in/around their home/field and their teaching and practice are therefore more directed towards individual conservation measures. The strategies for regeneration were different but still constitute an important sub-set for the skills acquired in relation to the rare plants. Learning about rare plants thus directly contributes to achievement of biodiversity conservation goal of CBC. Even though the sensitivity and basic learning about rare plants might have started along with identification, the detailed and systematic knowledge of rare plants is generally acquired later at the average age of 20.

5.2.3: *Interest in the plants*

‘Being interested in plants’ is considered as the second most-important skill by the *vaidus*. Interest in plants is considered an important foundation skill by *vaidus* from both field sites. ‘One who does not like to play around with plants should not come into this profession’ (personal interview, JY, Amboli). In fact, many healers mentioned lack of interest as one of the important factors in impeding transmission of TMK to younger people. The interest in plants has been expressed as a set of the three sub-skills: a) developing sensitivity towards local biodiversity; b) showing a desire to learn about plants; and c) curiosity to learn about plants.

An interest in plants developed at a young age in many healers, during performing family support chores such as cattle grazing or assistance in farming. Since most of the healers had opportunities to see and/or assist their parents or relatives in treating patients, the desire to learn was followed.

When a farmer from a neighboring village had snakebite and visited my father, my father asked me to accompany him in the forest. I went with him to the forest to help him in removing the bark of two different plants. My father gave an oral dose of a medicinal pellet made from these two different barks and the patient was cured. This incident not only reinforced my faith in plant-based medicine, but inspired me to learn it' (personal Interview, DD, Amboli).

In general, the interest started building at the age of 14 years and, if nurtured externally (through incidences like this), or by a mentor, it provided an entry point to become a *vaidu* by gradually learning other skills.

5.2.4: Harvesting of the plants

The harvesting of plants, or their parts, scored slightly above the combined average score for all ten skills (2.34) and is considered a crucial skill both by local healers as well as formally-trained field botanists (RCMPCC, 1999). Therefore, it is a highly-valued skill to practise as a good healer. In order to ensure long-term availability of the plants, the method and process of harvesting is very important. According to healers, the skill complex of harvesting comprises of a sub-set of five skills: a) part of plant and quantity of which to be removed; b) method of harvesting; c) time of removal; d) special rules/care to be followed while harvesting; and e) religious rituals to be performed during/after harvesting.

Most healers indicated that no plant part should be removed until the plant is strong enough to withstand the loss. In general, a mature plant of more than 15 years old should be chosen for removal of the required parts. The right method of harvesting varies according to the growth of the plant and nature of the cure. However, as a general rule, the length of the removed bark should not be more than one foot, and the cut should not penetrate more than six inches deep. The time at which plant parts are harvested is

important. Many healers, from Baripada, for instance, believed that Saturday night is an auspicious time for harvesting. Saturday night harvesting and Sunday treatments are the most common practice among the local healers of Baripada. 'Plants harvested during the full moon on Saturday nights are at their best in terms of vigor and effectiveness' (personal interview, RB, Baripada). In addition, knowledge of special care or practices related to safer harvesting is also considered important. Most of the healers have revealed that their shadow should not fall on the plants while harvesting. Similarly, many healers would never remove the bark in a circular fashion, avoiding a ring shape or complete removal from the stem. They believe that such a removal will permanently damage the xylem cells, which might lead to drying and death of the plants.

In addition to these special practices, religious or holy ceremonies are also performed while removing the useful parts of the plants by healers. 'Whenever I remove part from a plant, I pray to the plants to bless us with their healing power' (personal interview, CSJ, Baripada). Many healers from Amboli and Baripada offered a handful of rice and prayer to plants before they remove them. 'I worship medicinal plants by chanting *mantras* and offering one rupee and 25 *paises*,¹⁵ before I start removing any part from them' (personal interview, LP, Amboli).

Most healers from Amboli, on the other hand, offered prayers while removing plant parts. During such prayers, they appreciate the effectiveness of the medicinal plants and express their gratitude. Knowledge of planetary movement is also a part of their learning of ceremonial rituals by healers of Baripada.

My guru taught me that certain plant parts should only be harvested on full moon night so that I can get the full vigour of the plant quality in the drug. During full moon nights, other planets in the universe remain calm so that goddess of plants moves around in the forest and showers her blessings (personal interview, SB, Baripada).

¹⁵ *Paisa* is the smallest unit of an Indian currency. One hundred *Paises* equals to one rupee.

The five sub-skills on harvesting of medicinal plants required a longer time period to learn (more than three years) after the skills of identification and location of medicinal plants were acquired. The mean age at which the skills of harvesting were acquired was over 18 years.

5.2.5: *Processing of the plants*

The processing of medicinal plants is rated as a crucial and important skill by the healers. The useful plant parts are either given as medicine in raw form or are processed in a variety of forms. The most common forms reported by healers were crushed drugs, paste, fresh juice, (dried) powder, decoction, ash, *lehya* (semi-solid form derived by mixing powdered drug in a liquid base for ingestion), porridge, *lepa* (powder or paste in oil base for external application) and *dhoopa* (smoke for inhalation). As indicated by the healers, the sub-set of skills for processing medicinal plants includes: a) knowledge of parts and their proportions; b) the method and process of preparation; and c) storage of raw plant parts or final products.

The knowledge of useful parts and their proportions is essential to prepare the required formulations.

Plant like *Bhuykuli* if taken orally, even for a taste, can be extremely dangerous for humans and animals. However, if we dilute it in great quantity of water and then sieve it through cotton cloth four to five times, then it becomes a very good concoction to cure rabies' (personal interview, MC, Baripada).

Some healers use combinations of various plants in a variety of forms to make complex products. For example, a healer from Amboli mixes and crushes the dried barks of *Palas*, *Biba surangi* and *Tamalpatra* in equal proportions. A small quantity of water is then added to make a round ball, which is heated through the smoke of a *gugle* tree bark. While smoking, the flour of *Raagi* plant is added and the final product thus obtained is used to treat a variety of wounds and bone injuries in cattle. 'Some concoctions are given fresh while others are kept overnight for better effects' (personal interview, VMG, Amboli). The skill of storage is, therefore, also considered important. Most healers use earthen pots and avoid metal containers to store the concoction of liquid products

overnight. Few healers like LP from Amboli, with the support from his educated sons, use well-labelled plastic bottles for dried herbal powder. LP has also printed handouts in the local language for his products. He has created a small processing unit in his home which has a small grinder and a power operated packing and sealing machine. Most healers have a well-developed understanding of when to use fresh or stored plant parts. On an average, the skills of processing are acquired at the age of slightly above 19 years.

5.2.6: Consultation with the patients

The skill of consultation has a slight overlap with the evaluation skills and consists of a sub-set of four skills: a) establishing personal rapport with patients; b) instructions for repeat treatment; c) special care and advice while dealing with either serious illnesses or special groups such as women, elders and children; and d) getting feedback through dialogue with patients.

Establishing personal rapport with patients was considered as one of the foundational skills by healers. Most healers, either through planned or informal meetings or during conversations at the village gathering or on the farms or in the forest, developed personal relationships with the patients. 'Some of my patients from the village and outside have also become good friends' (personal interview, JG, Amboli). However, in some cases, particularly with healers from Amboli, there are better opportunities for outside exposure (through organizations like RCMPCC) and technologies (telephone, newspaper and television). While healers have opted to develop personal relationships by visiting their patients, they have not shown the same enthusiasm for judging the effectiveness of earlier treatments.

The consultations also involve a set of repeat instructions, which overlap with the skills of evaluation. The repeat instructions are often prescribed during the second visit by the patients for change of dose, change of treatments, referral to another healer, or dispensary. 'I always try to administer the stronger dose in the first go and then gradually move to less strong doses, if there is an improvement. So the second round of dialogue

for the repeat instructions is always part of my overall treatment strategy' (personal interview, JY, Amboli).

The third set of skills is related to special care and handling of serious illnesses, or special groups like sick children, women, and old or disabled people. Patients suffering from serious illnesses such as cancer or infectious diseases are separately handled and given priority. 'I treat patients with serious headaches or sexual diseases early in the morning, around 4.00 am' (personal interview, RB, Baripada). Children, women and older people are either given priority or treated at their places of preference by half of the healers interviewed. 'I prefer to treat children in homes where they feel safer, secure and close to their parents' (personal interview, LGG, Amboli).

The final set of skills related to consultation is about establishing a specific dialogue with patients in order to diagnose disease. The local healers ask symptom-specific questions and check how the behavior and well-being of patients are affected by existing ailments. These disease-specific questions are sometimes supplemented by additional physical examination such as *nadi parikshan* for diagnosis. In case of external injuries (wounds or snake bites), physical examination is often conducted. 'I start a funny discussion about joyful events, and then suddenly twist the sprained bone when patients have sprains or dislocation of bones and muscles' (personal interview, SA, Amboli).

Consultation skills are generally acquired at the age of 19 years, which is close to the time at which processing and application skills have been acquired. The average score of 2.27 for the consultation skills is higher than closely-related skills of application and evaluation, but still lower than the average score of all ten crucial skills.

5.2.7: *Habitat of the plants*

The knowledge of habitat of the plants was also considered as one of the important skills, with a higher mean score (above 2.22). Since the knowledge of habitat is also covered during teaching-learning of identification of plants, some healers felt that identification is a more inclusive category broad enough to include habitat. This may have caused the

lower score for the habitat skills, which is complex in terms of its importance. According to the healers, the skill complex of plant habitat consisted of a subset of a three skills: a) location of plants in and around the village; b) knowledge of eco-indicators as indicator of particular habitat; and, c) use of landmarks or specific symbols to relocate or indicate overuse/rareness of given plants. The first subset of the skill is related to learning about the location of medicinal plants. 'Sometimes we have patients with poisonous snake bites and immediate care and treatment is required. We must know, therefore, the exact locations of the plants, since fresh parts are required to prepare the concoction' (personal interview, RB, Baripada).

Some of the healers from Amboli and Baripada also travel more than 20 km on foot in search of certain plants like *Narkya* or *Amruta* that are becoming locally unavailable, largely due to commercial exploitation by traders from outside. Knowledge of plant, animal, or geographical features that are closely linked to the preferred habitat of certain plants is also believed to be a useful skill. For example, the presence of the black spider in certain patches of Amboli forest indicates the good habitat for the medicinal plants (personal interview, KG, Amboli). Similarly, medicinal trees like *Mahuda* (*Madhuka Indica*) thrive best when there is a rich source of underground water. Such interrelationships among geographical features, medicinal plants, and animals provide clues to better understanding of the preferred habitats of medicinal plants. The use of landmarks or other symbols that represent either location or status of that particular plant species is the third important skill that forms the habitat skill complex. 'I put a stone or tie a small flag on the branch of the some medicinal plants, particularly if they are small and not commonly found' (personal interview, JG, Amboli).

The plants that are becoming rare or locally extinct have been noted by special landmarks by healers so that they can be easily identified in the forest. In addition to rare plants, certain plant species that are used to cure serious health problems such as snakebites or scorpion bites have also been given special symbols (such as the presence of a large neighboring tree, or tying a string on a branch of the plant or neighboring tree, in a way that can be recognized from a distance). The plant habitat skills are acquired at the mean

age of 17 years, which is the same average age at which the identification skills are acquired; both, therefore, learned at the same age.

5.2.8: *Application of medicines*

The application of medicine is the next step in learning after one has acquired good knowledge of plants, their habitat and processes of preparing herbal medicines. As pointed out by the healers, the subset of skills that include learning about the application of herbal medicine are: a) number, length, time and interval of dosages; b) quantity/proportion; c) religious ceremonies to be performed during application; and, d) knowledge of side effects/counter indications between herbal drug and food, which is commonly known as food restrictions or *pathya*. At the average age of 19, the skills related to the application of medicinal plants are learned. The treatment is often prescribed by the healers in the form of dosages and frequencies at which herbal formulations need to be taken. 'I always make separate doses wrapped in old waste newspaper. A number of these small packets help patients in remembering the right interval and quantity of medicine' (personal interview, BB, Baripada). Some healers prefer to administer medicine at their homes.

For the treatment of cancer, I use fresh leaves of seven different types of plants, which are mixed with three other readily available powders from village shops. The paste is applied to the affected part as well as given orally. For such treatments, I advise patients to come to my home (personal interview, JY, Amboli).

The knowledge of combined or compound action (both synergistic and antidotal) of various herbs and other ingredients is also important. For example, to cure skin infections and blisters in humans, dried roots of *Bharangi* are crushed and mixed with water to make turbid lotion. The same lotion can also be used to treat eczema, blisters, and for first-aid treatment after adding a small amount of a child's urine.

The timing of taking herbal medicines varies according to the nature of diseases. 'As a general rule, herbs taken along with meals are the ones prescribed for stomach and

digestive ailments, while herbs that are administered to cure kidney and reproductive problems are generally advised to be taken before meals' (personal interview, RB, Baripada). Many of the healers also perform religious processes while administering their medicines. The most common form of religious ritual is chanting of *mantras*-- the divine and sacred verses, often sung in local dialects. These *mantras* are offered to the patients as well as the medicines. Almost half of the healers interviewed from both sites believe that mere herbal medicine might not work. One-fifth of them have indicated that performing sacred rituals is essential for making the medicine work. 'The medicinal uses of plants may be known, but the training about religious rituals completes the making of full-fledged practicing healers' (personal interview, JSC, Baripada). JSC is the well-educated (Grade 12 pass) healer from Amboli, who is well-known for curing tooth-related ailments.

The knowledge of *pathya*, or allowable dietary and lifestyle related restrictions are also important. While different healers prescribe different advice on *pathya*, the most common ones include: not to eat meat, not to eat black gram, and not to eat chili or spicy foods. For snake bite cases, the patients are encouraged not to sleep overnight. Sometimes the *pathya* is advised to be self-observed by patients. 'I ask my patients to carefully observe the effect of food and drug interactions on their bodies. After the drug is orally taken, the swelling may occur if sour-tasting food is eaten. Such food, therefore, should not be eaten' (personal interview, SC, Baripada).

5.2.9: *Evaluation of treatment*

The effect of treatment is often assessed by local healers, mostly through verbal feedback from patients. The skill of evaluation also included information from: a) established networks with local healers; and b) a physical examination (such as *nadi parikshan* (checking pulsation through hand)). More than one-third of the local healers have established contacts with at least five healers, while another one-third are closely connected with more than five healers in and around the villages. These healers maintain regular contacts through either informal or planned visits.

During such visits, almost one-third of the healers have either sought verification of their treatment or discussed the effectiveness of the same or related treatment for the same ailments.

The skills related to evaluation also correspond closely to the application of skills. For instance, time required for recovery takes into account the factors like length and interval of doses of the treatments. 'My treatment for jaundice in humans should show its results in seven days. 'If a patient does not start improving after a week, I change my dose or the treatment. If that does not work, I refer my patients to go to hospital in Ajra town' (personal interview, LP, Amboli). Most of the healers are well aware of the recovery period of their treatments. However, most of them would still like automatic visits by their patients for judging the effectiveness of the prior treatment. Four healers have used *nadi parikshan* to check the effectiveness of previous treatments. Physical examinations of affected parts were carried out by most of the healers, in the case of external diseases. For internal diseases, however, almost one-third relied on directly asking patients about the symptoms of the disease. The skills of evaluation, with a score of 2.18, seemed to achieve lower importance amongst the other ten crucial skills required to become a good healer. The skills of evaluation are also learned in the later teen years (19 years), just after processing and application skills have been learned.

5.2.10: Follow-up of the patients

The follow-up with patients is commonly practised at the end of treatment and is considered as one of the less important skills to become a practicing healer. As it appears and also indicated by some healers, follow-up is closely related to evaluation. Other healers, however, suggested that developing closer interactions and relationship with the patients is specialty knowledge and could only be acquired through follow-up skill. This skill complex has a sub-set of two skills: a) following up with patients either through personal visits or informal contacts; and b) referral to other healers. On an average, a healer treats close to 400 patients annually. In some cases, the healers reported treating more than 1000 patients per year. With the exception of two cases, approximately half of the healers engage in farming and the other half in businesses.

Following up with patients is considered very demanding in terms of time. This constraint becomes more severe if patients are from outside the village. The follow-up is therefore limited to occasional personal visits by healers to patients. However, for the patients from the same village, local healers maintain regular interactions. Sometimes they also create situations to compel patients to see local healers. 'I ask my patients to accompany me to the temple to offer small religious rituals to express thanks to the God once they are cured' (personal interview, JS, Baripada).

The second skill as part of the follow-up is referral to other healers or modern hospitals. This is considered useful after ineffective earlier treatments by a particular healer, or for the convenience of location.

I ask my patients to go to DS (another healer) for further treatment of foot infection. I have taught DS how to prepare the herbal paste and apply on patient's feet. Since I live in forest far away from village, this option works both for me as well as my patients (personal interview, JY, Amboli).

During follow-up, the advice on *pathya* or diet restrictions is the most commonly discussed topic by the local healers (slightly less than one-third), followed by general talk or examination for improvement (almost one-fifth). Interestingly, close to one-fifth of the healers have never made any attempt for follow-up with their patients. 'I consider follow-up as part of the consultation skill complex' (personal interview, BC, Baripada).

Consequently, follow-up is the lowest scored skill in terms of importance by healers among the ten crucial skills. It is learned between the age of 19 and 20.

5.3: Sources of traditional medicinal plant knowledge

As established in Chapter 2, one of the important dimensions of examining TMK transmission is to understand the sources from which the knowledge is learned. The sources for acquiring TMK among healers are mainly people, but in some cases, the experiences (such as dreams or events) also constitute useful sources for learning particular skills. The most often cited sources include family members or elder healers, who are also called *gurus*. Out of 46 healers from both villages, almost two-fifths have

learned from more than one teacher. Learning from more than one teacher usually happened in sequence. For example, after learning basic skills (such as developing interest and identification) from family members, younger healers could advance their skills about new plants, new uses, and build on existing skills by learning about rare plants from other healers or *gurus*. Most healers have acquired this knowledge from their family members and *gurus* (slightly less than one-fifth). Interestingly, in the four cases (two each from Amboli and Baripada), dreams or God's grace were cited as sources for TMK by healers. Among family members, one-third cited parents (mostly father) as their main sources, followed by parents-in-law (mostly fathers-in-law) and spouses (mostly husbands).

The skill-wise analysis of the data on various sources of learning collected through semi-structured interviews broadly indicates two directions: a) in general, the sources of acquiring TMK are multiple and could be different for different skills; and b) sources for female healers may be different than their male counterparts. For example, fathers-in-law and husbands have been cited as important sources by many female healers as compared to male healers who cited fathers as their main source (Table 5.2). What follows in this section is, therefore, is a skill-wise description of various sources used by male and female healers.

Table 5.2: Skill-wise & gender-wise distribution of various sources used by healers

Type of Skill	# different sources		Sources used by male healers		Sources used by female healers		Overlapped sources		Total
	M	F	First	Second	First	Second	#	Type	
Interest	3	7	Father	Guru	Father	Mother	2	Father, Uncle	8
Identification	2	7	Father	Guru	Father	Mother-in-law	1	Father	8
Harvesting	4	5	Father	Guru	Father	Spouse	1	Father	8
Habitat	4	6	Father	Dream	Spouse	Mother-in-law/ Uncle/dreams	2	Dreams, Uncle	8
Processing	4	5	Father	Guru	Spouse	Father	1	Father	8
Application	4	5	Father	Grandfather/ Guru	Spouse	Father	1	Father	8
Evaluation	3	5	Father	Guru	Spouse	Mother-in-law Father	1	Father	7
Consultation	6	4	Father	Friends/Guru /Self practice	Spouse	Mother-in-law Father	1	Father	9
Follow-up	4	5	Father	Guru	Spouse	Mother-in-law	1	Father	8
Rare plants	7	5	Father	Guru	Spouse	Mother-in-law	1	Father	11

Key: M= Male, F= Female, Total sources= # different sources (M+F) less # Overlapped sources

On the average approximately eight different sources were used at different stages of learning by male and female healers to learn the ten crucial skills. However, there is some overlap of sources used by both male and female healers. In general, to acquire the skills such as harvesting, consultation, follow-up, and rare plants, healers have used more than nine sources. Learning about rare plant occurs through 11 different sources (see Table 5.2), which also include non-familial sources, i.e. local workshops organized by local NGOs or healers outside the villages.

Many healers from both sites indicated that knowing about rare plants is a continuous endeavor, and information from all possible sources is accumulated. In terms of importance, the role of the father as the primary source remains common to both male and female healers. Close contacts with the father in earlier years helps in developing interest in medicinal plants and learning the two crucial skills of identification and

harvesting. While fathers continue to be the main source for male healers for teaching the subsequent skills of processing, application, evaluation and consultations and follow-up, in the case of female healers their husbands become the primary source of teaching those skills. Mother-in-law and father are two other useful family sources for teaching such skills. Following the social customs, most of the female healers go to their in-laws' house after marriage. Such skills are learned there; however, occasional visits to parental homes even after marriage for social purposes (such as attending family celebration or following the customs of delivering babies at parent's home), provide some opportunities for the female healers to interact with and assist their parents. Fathers, either during such post-marriage interactions or through separate systematic instructions, teach processing, application, and consultation skills as a second important source. In addition to systematic instructions from fathers, the female healers often accompany their mothers-in-law to the forest collecting fuel wood, working in agriculture and other livelihood chores, which provide an opportunity to learn about plants.

Fathers are the single most overlapped source for learning about all ten crucial skills. Among the male healers, however the *Gurus* or elder healers were considered as a second important source for learning all crucial skills (except that of habitat). Dreams of spiritual experiences are considered as the second important source of learning about habitat. The role of *angudi* or dream of spiritual grace was mostly acknowledged by male healers of Baripada and some healers from Amboli.

We can not find miraculous plants like *kali adad* without *angudi* or God's grace. This magic plant has distinct shining properties, which are rare to find. This plant glitters like gold in the forest and their locations can only be known by some blessed and innocent souls in their dreams. The person should not share the information on location to others. These plants are supposed to have a mysterious good fortune property which can bring prosperity to their owners. However, to make it work, it should be used along with some religious mantras (personal interview, HP, Baripada).

Besides dreams, fathers and uncles are the only two common sources that are used both by male and female healers for acquiring skills of identification and habitat.

5.4: Methods of learning traditional medicinal plant knowledge

The literature indicates that acquisition or dissemination of local knowledge systems in general can be structured into three pedagogical elements: apprenticeship, ceremonies, and practices (Daes, 1994). Learning within TMK as a sub-set of local knowledge systems, therefore, should demonstrate these pedagogical elements. In the Indian context, such learning is mostly believed to happen through oral and practical means (Hafeel & Suma, 2000). Male and female healers indicated their most preferred methods of learning about ten identified crucial skills.

Table 5.3: *Methods of learning traditional medicinal plant knowledge*

Skill	# methods used		Most frequently used methods used by male healers	Most frequently used methods reported by female healers
	M	F		
Interest	6	3	Guided observation, Extended discussion	Guided Observation, Self observation, Assistance to healers
Identification	4	6	Demo in Forest with a step-wise instructions, Actual practice	Demo at home with step-wise instructions, Demo in Forest
Harvesting	7	3	Guided observation, verbal instructions, learning by doing	Self observation, verbal instructions, Demo at home
Habitat	5	4	Demo while cattle grazing, Guided forest walk, Verbal dialogue on dreams	Verbal instructions and dialogue, Self-guided observation
Processing	4	4	Self observation, Guided observation, Assistance in actual practice	Assistance in actual practice, Guided observation
Application	3	4	Guided observation and dialogue, Demonstration	Self observation, Guided observation and dialogue
Evaluation	7	4	Demonstration, Dialogue	Repeated guided observation, Verbal instructions and dialogue
Consultation	6	4	Assistance in actual practice, Demonstration	Self observation, Guided observation
Follow up	8	6	Extended discussion, Assistance in practice	Extended discussion, Assistance in practice
Rare plants	5	5	Repeated guided-observation and demonstration, Hands-on	Practical demo in forest and home, Extended discussion, Hands-on

Key: M= male healers, F= female healers

On average, both male and female healers have used more than six methods to learn ten identified skills. A greater variety in terms of methods (N=8) were found in developing interest or follow-up with patients, and less variety was found for learning the skills of processing, application and rare plants among the elder healers (see Table, 5.3).

Most of these methods are self-explanatory. However, some of them were specifically explained by healers. For instance, observations, both self-directed and guided, were used by healers. In self-directed observation, learners observe plants or process by themselves without any instruction from healers. In contrast, learners are still observing plant or process in guided observation, but are provided clues and hints on the what, where, when and why to observe. Guided observations are often inspired by elder healers or teachers. Similarly, there are three types of verbal instructions reported by healers to learn different skills : i) simple verbal instruction, which is one-way flow from teachers to learners and less time consuming; ii) verbal instructions through dialogue where two-way flow of information between healers (teachers) and learners occur and require more time as compared to simple instructions; and iii) extended discussion which is a modification of dialogue where the elder healer or teacher mostly facilitate and lead the dialogue and may require several sessions to complete.

The use of various methods as reported by male and female healers (Table 5.3) can be classified into three categories: i) methods that are exactly the same or common to male and female healers for learning specific skills; ii) methods that exhibit some overlap between male and female healers; and iii) methods that are unique to a particular sex or do not show any overlap between male and female healers.

5.4.1: Methods that mostly overlap

Methods like extended conversation and assistance in practice are used both by male and healers to learn the skill of follow-up with patients (such as receiving feedback from patients either through their own visits or planned visit by the healers). The follow-up skill is usually learned through extended conversations with patients on the nature of care to be taken after the medicine is taken, and on preventive tips for the future. While some healers have relied on the follow-up visit by their patients, others have designed their own ways of maintaining contacts with healers, either by compelling patients to participate in thanksgiving rituals to god, or keeping in regular touch with patients. 'I have been asked to wait for automatic visits by the patients, rather than going to them' (personal interview, RB, Baripada). Referral to other healers was taught as a part of

follow-up skills, either by providing the names of other healers or assisting learners in getting practical guidance from other village healers. Referral was used by both male and female healers.

5.4.2: Methods with some overlap

Five of ten skills exhibit some overlap of methods used commonly by both male and female healers. These include skill complexes of interest, identification, harvesting, processing and application. Guided observation is the most frequently used method for developing interest and the skill of processing and application. Female healers have also cited self-directed observations for developing their interest and learning about harvesting and habitat of medicinal plants. On the other hand, guided observations have also been used by the male healers for developing interest and harvesting of medicinal plants. In addition, interactive forest walks with active dialogue has been reported as another important method of learning by the male healers.

Learning about the identification of plants occurs through step-wise instructions (shape, size, smell of leaves) in the forest for the boys and in homes for the girls. A male healer said 'I was asked to bring particular plants on my own after systematic instructions in the forest' (personal interview, JY, Amboli). Once a learner achieves a fair amount of identification skills under guidance, they are involved in the actual task of bringing plants by the elders.

The tendency of female healers to use their own self-evolved methods suggests that male healers are preferred as the receivers of knowledge by their teachers. This is further exemplified in the use of interactive methods for teaching the skills of harvesting and habitat skills to male healers. 'I was tested to identify the right plants in the forest with three seemingly identical twigs by my guru. When I tried and fumbled, my father gave me a series of clues to aid me in identification of right plants. Questions about taxonomical features of such plants were encouraged all along' (personal interview, JY, Amboli). Unlike female healers, many male healers have indicated the importance of questioning behaviour and detailing as important traits to become successful healers. 'I

was not encouraged to ask questions about new plants, particularly to my husband and my mother-in-laws. Sometimes such extra curiousness earned us a wrong label of being a brat and disrespectful to elders' (personal interview, JS, Baripada). Since most female healers have learned the advanced skills from their in-laws after marriage, they chose to be at the passive and receiving end of such one-way communication rather than through interactive modes.

However, learning about processing and application of plants requires active involvement and initial guidance by mature practitioners, and some use of the interactive and hands-on methods. 'I was asked to assist in making a concoction and *lapas* (paste) by my husband and to help in applying the *lapas* to patients, so that he could see other patients while I rub pastes on the patients' body parts'. The nature of the skill, in this case, demanded more interactive and two-way communication between female healers and their teachers. The questioning by female healers, which is often discouraged in learning skills such as identification and harvesting, is encouraged while teaching skills of processing and application from their husbands as teachers.

5.4.3: *Methods with no overlap*

Learning about habitat, evaluating the effectiveness of medicine, and consultation with the patients are skills that have been acquired through different methods by male and female healers. While practical demonstration with dialogue is used by male healers, female healers have reported use of guided observation as the most common and frequent method to learn these three major skills. The male healers seemed to have had more interactive and hands-on approaches to learn about habitat, as well as post-treatment skills like judging effectiveness of previous treatments, and consultation with patients.

When I shared my dream about the location of some medicinal plants with my father, he took me to that location in the forest. He then showed many medicinal plants in that location and described their uses. He also explained the significance of such dreams and their possible interpretations (personal interview, CS, Baripada).

The evaluation of treatment (e.g. through *nadi parikshan* or through verbal feedback from patients) and consultations (e.g. conversation with patients or instructions for repeat treatment) have a subset of overlapping skills which are acquired through similar methods. Among male healers, the skills of evaluation and follow-up are learned through demonstration and participation in actual practice, while in females they are acquired through a mix of self-directed and interactive methods, such as verbal instructions, guided observations and demonstrations. 'My father-in-law taught me how to decide on the second course of treatment through *nadi parikshan* by demonstration on actual patients' (personal interview, PS, Amboli).

I used to assist my husband in crushing bark and making powders. After I gained some experience and interest, my husband has asked me to sit along with him while he consults patients and administers medicine. I have watched him practising and he would walk me through the entire process from administration of drugs to follow-up procedures on patients (personal interview, PR, Baripada).

The female healers are taught through demonstration and guided observation, often at their in-laws' house at a much later age of their learning cycle. The changes in the sources of teaching for females--from parental sources to in-laws--often occur after their marriage and might contribute to different and less interactive methods of learning.

While there has been some sequencing in terms of methods used by male and female healers with a gradual movement from observation to demonstration and hands-on practice, the choice of methods depends on the nature of skills and, to a certain extent, gender. For example, in general for learning the initial set of skills of identification and harvesting, more indirect methods such as observation (self and guided) and practical demonstrations were used, while for more advanced skills such as evaluation of treatment, follow-up and identifying the rare plants more direct methods such as guided and repeated observations or assistance in actual practice have been used.

Two main sites for learning most skills are the home and the forest. The initial set of skills such as identification, harvesting and habitat of medicinal plants (including rare

plants) are acquired mostly in the forest, or, in some cases in the home herbal gardens (created by the few healers from Baripada). The skills of processing and application of herbal formulation and post-treatment skills (e.g. consultations and follow-up) are mostly learned at home both by male and female healers. Interestingly, skills like identification or habitat of the plants are also learned during livelihood chores by most males (e.g. cattle grazing duties) and a few female healers through fuel wood collection. Learning of skills such as harvesting of plants at home has provided limited opportunities for hands-on practice for the female healers more so than the male healers, who have practised harvesting in the wild.

5.5: Loss of transmission: Healers' perspectives

Various Aboriginal research institutions and scholars (Dene Cultural Institute, 1993 and Pinkerton, 1994 as cited in Ohmagari & Berkes, 1997, p.198; Tsuji, 1996) have expressed concern over the rapid loss of TEK held by community elders. Such concerns are more serious and imminent in developing countries like India where conservation scholars have already cautioned about the alarming rate of erosion of TMK due to lack of its intergenerational transmission and (Balasubramaniam, 2000; FRLHT, 2000; Shankar, 2004) and its negative impact on local conservation (Gupta, 1999; Chand & Shukla, 2003). This section identifies the factors that may affect the process of TMK transmission based on the opinions of the healers and their disciples. It also analyzes the relative importance given by healers and budding healers on the ten identified skills, in order to highlight the skills that might be vulnerable to being lost.

5.5.1: Reasons offered by village healers for the loss of transmission of traditional medicinal plant knowledge

Through semi-structured interviews, local healers were asked to indicate the three most important reasons, in rank order, for the decline in the transmission or erosion of TMK. These responses are grouped into a set of nine major statements based on their common central idea or overlapping thread. These statements were also shared in focus groups to verify accuracy in capturing various ideas or threads representing erosion of TMK. Besides the general opinions of the focus groups, the preferences of male and female were separately observed and frequencies recorded. The responses are summarized in the following table:

Table 5.4: Reasons for loss in traditional medicinal plant knowledge: Responses of male and female healers

<i>Reasons offered</i>	<i>Amboli</i>		<i>Baripada</i>		<i>N</i>
	<i>male</i>	<i>female</i>	<i>male</i>	<i>female</i>	
Incomplete transmission	+	+	++	-	17
Lack of interest by younger people	+	+	+	++	16
Lack of governmental support and recognition	++	+	+	++	14
Lack of documentation	+	+	++	+	14
Decreasing medicinal plants in/around village	++	+	+	+	13
Illiteracy among local healers	+	+	+	++	11
Lack of respect towards healers by the villagers	+	+	-	++	11
Old healers reluctant to transmission	-	+	++	++	10
Rules of learning not followed by young learner	+	-	++	+	9
Stricter adherence to the rules by old healers	+	+	+	++	7
Lack of encouragement by other medical practitioners	+	++	+	-	6
Indifferent attitude of the local schools	++	+	+	+	6

Key: - = Not evident
 + = Evident
 ++ = Strongly evident
 N = frequency of the times at which the responses were quoted

While most of the reasons indicated in Table 5.4 directly affect the process of transmission, such as incomplete transmission, lack of interest, rules of transmission not followed, or too strict, others are indirect and institutional and related to schools or modern systems of medicine. The set of reasons in the first category include: a) incomplete transmission; b) lack of interest by younger people; c) lack of respect towards

healers; d) older healers not transmitting; e) stricter adherence to the rule of learning by older healers; f) rules not followed by the young healers; and g) illiteracy among healers.

Incomplete transmission means all ten identified skills are not fully taught. Many young healers, particularly from Baripada strongly felt that older healers are not transmitting the complete skills.

Three of us approached RB, and expressed the desire for him to mentor us to become practicing healers. He gave us a difficult test of identifying and picking up the twigs of 20 plants overnight. The local names of the plants were given as a test and a time of overnight was given as test duration. Until morning we could locate and identify only five plants. The passing performance requires at least 15 plants to be correctly identified and brought. RB rejected all of us just because he felt we were not yet mature enough to learn completely about the plants. We think an elder healer like RB should have guided us in the forest and gave us some hints during the test. However, we managed to learn about the few plants in the surroundings (focus group discussion, Baripada).

Such a strict test for identification is often given in Baripada and plants selected for the test are not easily found.

The focus group discussion with young learners in Amboli and Baripada also revealed interesting details about which skills are taught and which are not. For example, in Amboli, *vaidus* would only show treatment or actual uses of plants without disclosing their names or locations. Baripada healers would only show some common plants and reveal their names, but they would not give any clues about the actual uses of the plants or the treatments. While these concerns express the dissatisfaction of the young or budding healers, the older healers on the other hand blamed younger healers for not showing interest, persistence and preparedness for hard work. 'Those who are persistent in their efforts demonstrate the most interest, no matter how many times they fail in tests' (personal interview, RB, Baripada).

The young learners often do not ask the right questions about the plants. They want to learn at home rather than going to the forest and bringing plants, when we

ask them. Such lethargic attitudes make them unfit for the demands put forward by the noble service of healing (Focus group discussion with local healers, Baripada).

The rules of learning in this case have been either strictly observed by the old healers (according to budding healers) or not followed by the young healers (according to the old healers). Several healers from Baripada would not share complete information in the first round of teaching because the young healers may not show up again and would not regard them as *guru* in future. The partial sharing of information was deliberately practised by a few healers as a strategy to establish themselves as *gurus* who know all about plants and, therefore, should be respected and consulted in the future.

Another reason related to poor transmission or lack of transmission is the tendency of older healers not being open and enthusiastic about their teachings. In Amboli, most old healers have shown willingness to teach 'only to their family members' or relatives from their family circles. In contrast, healers from Baripada come from a relatively homogenous clan and have expanded their circles of disciples, in one case more than 45, both from within and outside the village. The budding healers from both villages have mentioned 'elders being choosy about the selection of the disciples, even to teach their family members'. This is reflected in the list of values that were sought out by older healers in response to a question in a focus group: 'what are the qualities of a good healer'. Sincerity, curiosity, natural love for plants, faith and confidence in TMK and their transmitters, service motive, sympathy towards plants and animals, community awareness, religious or spiritual attitude, free from drugs and alcoholism are often cited characteristics that older healers would look for in budding healers.

Religious or spiritual learning is considered an integrated component of crucial skills. The skills of plant habitat, harvesting, processing, application and follow-up explicitly reveal the importance of *mantras* or spiritual chanting as part of their overall skill complex. Interestingly, less than half of the healers solely rely on medicinal power of the plants. The remaining (more than half) rely either fully or partially on *mantras*. Only seven of 33 healers, believe that mantras are inevitable for making the medicinal power

to work. 'The skills are important to learn, but to become a true good healer you should also have certain values' (focus group discussion with healers, Amboli; focus group discussion with healers, Baripada). Statements like 'If you expect monetary rewards and forget about your patients, this may not be the right profession' (personal interview, RB, Baripada) and 'If you charge money, you will tend to lose your reputation and eventually the blessings of god or spirits from which you acquire knowledge' (personal interview, JIG, Amboli) reassert the importance of a selfless societal service motive of the healing profession over monetary rewards. In Baripada, many budding healers mentioned that older healers often preach to them that 'TMK demands secrecy and not be revealed to persons who do not possess the right values, even if they are skillful and educated' (focus group discussion, Baripada healers). The mismatch of values, if any, as observed in young learners, is considered as disqualification by older healers, which is often being (*mis*)¹⁶ interpreted as older healers being reluctant to teach.

Lack of respect towards elder healers at the local village level is also considered an important factor hampering the process of transmission. This concern is mostly expressed by the female healers from Amboli and Baripada. In Amboli, however, the male healers from the lower caste (scheduled tribe/nomadic tribe category) have also complained about the disrespectful treatment by the community leaders from the village. More than half of the healers come from the scheduled castes and nomadic tribe background. Except for one case from Amboli, all healers of scheduled/nomadic tribe are from Baripada village. In Amboli, village healers from dominant caste group such as *Marathas* seem to have influence over healers from other castes¹⁷. This is not seen in the homogeneous village communities of Baripada. Several healers, who are also community leaders in Amboli, have strong influence over other healers. These leaders-cum-healers have become power centers for other village healers, irrespective of their caste.

¹⁶ My emphasis.

¹⁷ During group discussion with a mixed caste group of healers, the healers from so-called lower caste voluntarily decided to speak last after all healers from dominant caste group of Gawde group had spoken. In a personal interview, a healer from a nomadic tribe mentioned, 'they dictate what to speak and how much to speak in the public'.

If I have to represent the village in a district or state workshop, I would have to seek their concurrence and report back what happened in a common village meeting. I would not mind sharing my experiences to community leaders voluntarily, but I feel that such participation and sharing are often controlled by a group of powerful community leaders and not in the right spirit (personal interview, JD, a local healer belong to nomadic tribe from Amboli).

The concern for disrespect towards female healers is more evident in Baripada. 'Female healers are often seen as midwives or healers assistants (to their husbands or parents in-law). As soon as we move beyond those perceived boundaries and treat patients independently we were not encouraged even by our own family members' (personal interview, JS, Baripada). Such disrespect reflects and perpetuates the stereotype of the male-dominated societies towards their female counterparts even in the 'noble' profession of healing.

The illiteracy of the healers is also impeding transmission. More than three-fourths of the healers are illiterate from both villages. Women are most disadvantaged in terms of literacy. In Baripada all of them are illiterate. 'Illiterates are looked down upon, and healers are no exceptions. In a fast changing world, skills like follow-up require systematic record keeping, and writing skills will definitely come in handy' (personal interview, Baripada, SC). Fourteen of 33 healers have suggested that they would wish to maintain written records of their patients for a better follow-up. 'I know I am illiterate but I would very much like to get educated disciples who could get better respect in the village and perhaps talk more confidently with the patients during consultations. Literate healers could create and maintain written records, which may help them to recall patients' histories more quickly (personal interview, KR, Baripada). In fact, most healers mentioned that they would like to have disciples with some literacy skills (Focus group discussion, Amboli and Baripada). Illiteracy of the healers also contributes to inability of self-documentation by the healers.

Lack of documentation was also an important concern expressed by most healers, more strongly in Baripada. In Amboli, the extent of overall literacy among healers is greater than Baripada. Efforts like the village biologist program and local healers' conventions by RCMPPCC in initiate and strengthen documentation processes. RCMPPCC, in consultation with local healers, generated a list of 109 plants (local, *Marathi* and botanical names) commonly found in the forest of Amboli. 'We need to expand the list and also describe their common uses (Focus group discussion with healers, Amboli). In Baripada, however, efforts of NGOs like JF are more geared towards economic development and conservation of village forest rather than medicinal plant species. 'We should document at least common medicinal plants, with photographs, and their uses, in our *Arani* (local tribal dialect) and *Marathi*, in a way that it becomes a village heritage. The documentation of certain special plants, however, should be limited to the healers. We can teach those plants to the disciples, who are mature enough' (Focus group discussion with healers, Baripada). 'I can describe the plant uses but would prefer not to give their names, unless you stay with me for a year and prove your interest' (personal interview, JY, Amboli). Selective documentation is, therefore, more preferred by the healers of Baripada and a few healers from Amboli. Baripada healers, however, have initiated a community biodiversity register program in 2005 (Shukla and Gardner, 2006). Such register provides good documentation of local plants and their uses.

The loss of medicinal plants is also cited as an important reason for the loss of transmission especially by the male healers of Amboli and female healers of Baripada. During focus groups in Amboli and Baripada, local healers generated a list of the plants which are either becoming rare or less visible, and jointly explored the causes of loss and outlined strategies for regeneration. The reasons for loss of such plants vary according to the type of plants, but the most common causes of loss in general are either destructive methods of extraction both by healers from within and outside the village or illicit cutting by commercial harvesters from outside the village. 'Learning about the rare plants is a necessary skill for new learners. If we do not have those habitats where such plants grow, where else can we teach students' (personal interview, GG, Amboli). 'Skills such as identification, habitat, and correct harvesting of useful parts are best taught in the wild

and not at home' (personal interview, JSC, Baripada). Most of the healers believed that loss of plants and their locations would result in an eventual loss of the sites of learning, which could interfere with the process of transmission.

Local formal institutional factors such as schools and allopathic systems have been held responsible for generating negative attitudes towards TMK, particularly in Amboli.

Those who go to secondary schools have to move away from our land and lose contacts with us. When they come back from school during holidays, they seem to be more interested in talking about their own experiences of formal education and not enthusiastic about learning about the plants (personal interview, BP, Baripada).

There is no school after Grade 5 in Baripada, and those who wish to study go to the residential schools known as *niwasi shalas* in the neighboring villages. The proportion of school-goers is less than 20 percent of the total school-going population of Baripada.

Therefore, the reasons for young people not taking interest seem to be stricter systems of learning and testing designed by the elder healers rather than formal schools. In Amboli, easy access to both formal school system and modern medical practitioners is blamed for cultivating negative attitude towards learning about TMK.

Our children feel that what they learn in school is superior, which sometimes make them arrogant and indifferent towards local healers. They prefer to go to the doctors in clinic. The modern medical practitioners and village schools should mutually work together to develop an understanding that TMK is an inferior alternative and should be a last resort (focus group discussion with healers, Amboli).

On the other hand, school teachers of Amboli felt that community leaders were not enthusiastic in supporting school activities. 'Not only is there a lack of required support from the community leaders, but there is also no appreciation for school teachers and their contributions. Some villagers even consider school as an 'outside village institution' (Focus group discussion with teachers, Amboli). The absence of a congenial relationship

between local villagers and secondary school has been a contributing factor to the lack of respect towards TMK practitioners by school teachers, administrators and students. In Amboli, access to public health clinic and regular medical camps provided alternative health opportunities to the villagers. Baripada villagers do not have easy access to modern medical facilities and have to walk more than 11 km to consult an allopathic medical practitioner, who is employed by local NGO VKA, in the nearby town of Warsa.

5.5.2: The differences in relative preferences to crucial skills by young and old healers

The previous section highlighted the importance of process of transmission in preserving TMK. It is, therefore, important to know what skills are more vulnerable to being lost through the perspectives of old and young healers. Most of the young healers are not full-fledged practising healers, but were chosen by the elder healers as their disciples or apprentices in training. Do the young or budding healers score the identified crucial skills with the same level of importance as their teacher or elder healers? The response to such a question could provide useful insights on the set of skills that are considered as not important to the younger healers, and, consequently, are vulnerable to being lost during current or future transmission.

Such differential preferences between young and old healers were analyzed through the Mann-Whitney test using SPSS 13.0, v. 13. The Mann-Whitney test value U is used to compare the differences between two groups whose distribution is not normal. Members of both groups were asked to rank their preferences (1= less important, 2= important and 3= most important) on ten skills required to become practising healers. This rating scale is not linear. In other words, the difference of the preferred ranks between 1 and 2 may not equal the difference between 1 and 3 or 2 and 3. These qualities of data disqualify us for using the t-test, so instead I use the non-parametric Mann-Whitney test. The null hypothesis is there is no difference between skill ranks by Group 1 (old healers) and Group 2 (disciples or young healers). That means we assume that old and young healers would rank the ten skills with same importance.

Table 5.5: Mann-Whitney (*U*) analysis of the ranks between young and old healers

Groups 1= Disciple, 2= Healer		N	Mean Value of skill	Standard Deviation	Mann-Whitney <i>U</i>	P (2- tailed assym)
Interest	1.00	27	1.89	0.641	237.00	0.001
	2.00	32	2.47	0.621		
	Total	59	2.20	0.690		
Identification	1.00	27	2.15	0.718	236.500	0.000
	2.00	33	2.76	0.435		
	Total	60	2.48	0.650		
Habitat	1.00	27	2.22	0.751	435.500	0.873
	2.00	33	2.24	0.792		
	Total	60	2.23	0.767		
Processing	1.00	27	2.26	0.656	394.500	0.533
	2.00	32	2.34	0.745		
	Total	59	2.30	0.701		
Harvesting	1.00	27	2.04	0.649	318.500	0.033
	2.00	33	2.39	0.556		
	Total	60	2.23	0.620		
Application	1.00	27	2.00	0.734	375.500	0.267
	2.00	33	2.21	0.820		
	Total	60	2.11	0.783		
Evaluation	1.00	27	2.48	0.580	361.00	0.170
	2.00	33	2.18	0.797		
	Total	60	2.32	0.725		
Consultation	1.00	27	1.74	0.656	274.50	0.007
	2.00	33	2.27	0.761		
	Total	60	2.03	0.758		
Follow up	1.00	27	2.26	0.656	359.500	0.143
	2.00	33	2.03	0.585		
	Total	60	2.13	0.623		
Rare plants	1.00	27	1.81	0.681	225.500	0.000
	2.00	33	2.52	0.755		
	Total	60	2.20	0.798		

The Mann-Whitney scores or *U* values for the skills sets of identification of rare plants are 236.50 and 225.50, which are highly significant ($p < 0.001$). The higher mean scoring on identification of plants (mean=2.76) and rare plants (mean= 2.52) by the older healers compared to their disciples (mean for identification= 2.15, mean for knowledge of rare plants=1.81) indicate that older healers consider those skills more valuable than young healers. The *U* value for the skill complex of interest is also significantly larger (237.00, $p=0.001$) indicating that the old (mean = 2.47) and young healers (mean = 1.89) differ

significantly in terms of valuing interest as a skill to learn. The same trend is observed for the skills sets of consultation and harvesting, with *U* values of 274.50 ($p=0.007$) and 318.50 ($p=0.033$). Interestingly, the disciples put more weight on the skills of evaluation and follow-up than old healers, although their mean scorings do not differ significantly. The reasons outlined in previous sections can provide justification for the lower scoring of some of the skills by young aspiring healers.

5.6: Chapter summary and discussion

The literature reviewed in Chapter 2 and the findings reported in Chapter 4 underscore the importance of traditional ecological knowledge (TEK) to community-based conservation (CBC). The two CBC initiatives discussed in Chapter 4 also suggest that local knowledge about plants or traditional medicinal plant knowledge (TMK) was the most important form of TEK being used. This chapter therefore considered TMK and its transmission by focusing on: a) identification of skills crucial to becoming a healer; b) how these skills were learned by healers; and c) factors that impede the transmission of TMK.

By focusing on a manageable number ($N=10$) of crucial skills, it was possible to collect data on their relative importance from two generations of healers-- the older healers and the young healers chosen as disciples by older healers. The need for such a cohort-based analysis in understanding loss of intergenerational transmission has recently been emphasized by some scholars such as Haarumaya (2003b) who noticed that such an approach was lacking in previous studies. Some of the crucial skills such as interest, identification, harvesting, processing and application; identified in the present study; were also reported in earlier studies on TMK transmission (Chand & Shukla, 2003; FRLHT, 2000).

The average scores (which reflect degree of importance ascribed by local healers) for the skills of interest; identification, harvesting, processing, and knowledge about rare plants; were higher than the overall average score for all ten crucial skills. These skills,

therefore, were highly valued by the healers. These highly-valued skills were identified through focus group discussion as being foundational skills which are learned during the initial stages of healers' training. The second set of skills (such as processing, follow-up, consultation), with scores below the average of all ten skills, may be called human skills since their learning entails understanding of interpersonal communication and relationships with patients. These skills were comparatively less valued and were learned after the foundational skills had been acquired.

Some of the highly-valued skills have contributed to local conservation efforts. For instance, local NGOs, such as RCMPCC and community-based organizations such as the Baripada Forest Protection Committee encouraged and used village healers in regeneration and sustainable use of rare plants through the creation of village-based herbal nurseries and home herbal gardens (Section 5.2.2). The sustainability of local medicinal plants was viewed as an integral part of one's learning to become a practising healer. Initiatives such as the village biologist programs and local healers' conventions organized by RCMPCC, and the plant diversity register initiated in Baripada helped in demonstrating skills such as interest, identification, habitat, processing and knowledge about the rare plants. These programs (see Chapter 4) reinforced transmission through their explicit use in informing and improving local biodiversity conservation. RCMPCC, in particular, promoted learning of consultation skills by widening the exposure and contacts between healers and the outside world (Section 5.2.6).

Skills from 'interest' to 'knowledge about the rare plants' were gradually learned with increasing age. In the age group of 14-21 years, all ten crucial skills were learned. Certain closely-related skills were learned simultaneously (such as identification and harvesting) and skills such as knowledge of rare plants were acquired throughout a healer's life. On average, within a period of two years, learners' interest turned to a familiarization stage when they acquired the basic skill of identification. A gap of more than two years between learning of identification/habitat and harvesting skills implies that one would spend more time in learning the skills of identification of plants and their locations. This research thus reconfirmed the fact that age is an important aspect in examining

transmission of local knowledge systems as also shown by previous studies (Hewlett & Cavalli-Sforza, 1986; Ohmagari & Berkes, 1997; Ruddle, 1993; Ruddle & Chesterfield, 1977).

This research also established that between the ages of 14 and 21, the critical skills to become TMK practitioner are learned. This result is not completely consistent with the findings of previous studies that reported the 2-15 years age period as an important phase of learning (Ohmagari & Berkes, 1997; Ruddle, 1993; Ruddle & Chesterfield, 1977). One possible explanation for such a difference is that unlike learning of subsistence skills among most children in local communities (which is the case in earlier studies), TMK learning entails transmission of specialized skills and is restricted to selected children. However, the age at which children start learning TMK and the learning period (age group 14-21) revealed by this research is in agreement with the findings reported in a previous study on TMK transmission from India (Chand & Shukla, 2003). In that study, though some learners of TMK began to develop an interest in medicinal plants as early as five years, the actual learning started at a much later age.

The use of both horizontal (such as friends, other healers, community leaders) and vertical sources (family members, relatives) in TMK transmission as demonstrated by this study reconfirmed these learning sources as important in transmission (Ruddle & Chesterfield, 1977). As specified by healers in this research (Section 5.3), most of the foundational skills were learned through family members, in most cases, the father. On average, more than eight sources for acquiring skills to become TMK practitioners were used. This finding supports the results of earlier research which identified the father and other familial sources of learning as important vertical sources (Ohmagari & Berkes, 1997; Vanderbroek et al., 2004) and community elders and dreams as horizontal sources (Ankli et al., 1999; Ladio & Lozada, 2001) in transmission. The selection of sources can, however, be gender and skill dependent. For instance, female healers used a greater variety of sources (average =6) for learning the ten crucial skills. Husbands and in-laws were important sources for learning the human skills such as consultation and follow-up because they were acquired at the later stages of life by the female healers (after

marriage). In the case of male healers, *gurus* or other village healers, who are neither relatives nor family members, were other important sources for learning human skills. While the gender of learners was considered an important consideration in a few studies on transmission of bush skills (see for instance, Ohmagari & Berkes, 1997), the nature of the skill could become an important factor in determining sources of transmission.

The availability of multiple sources of learning is important in continuing the transmission of TMK at the local level as discussed above. In Amboli, the local healers were involved in the village biologist program, CAMP and healers' conventions activities organized by RCMPPCC. Such activities helped in establishing contacts with outside healers and generating additional and non-traditional sources of learning. The effort being out into using such non-traditional sources in encouraging TMK transmission needs to be further strengthened. In addition, how gender and the type of skill affect the selection of learning sources is a promising area for future research.

Another important dimension of local knowledge transmission is the learning methods (Ruddle & Chesterfield, 1977). This research confirmed that on an average more than six methods were used by both male and female healers during transmission of TMK, similar to the variety of methods reported in earlier studies (Ritchie & Ritchie, 1979, Ruddle, 2000; Simpson, 1999). The greatest number of methods was used in developing interest about medicinal plants and conducting follow-up with patients. In general, to learn the foundational skills more indirect methods such as observation or demonstration were used. To learn the human skills (at a later stage) such as evaluation and follow-up, more direct methods such as guided and repeated observation and assistance in actual practice were used. The methods correspond generally with the eight-stage learning sequence model presented by Ruddle and Chesterfield (1977), where the learner moves from familiarization (developing interest about plants) to equal partner with instructors (assistance in actual practice and self-practicing).

The methods used for male and female healers' learning exhibited some overlap. The use of interactive methods, such as encouraging questioning from disciples by older healers

was more visible in male than female healers, particularly for the learning skills of identification, harvesting and habitat. However, for learning skills like processing and application, the use of interactive methods (e.g. questioning) was common, irrespective of the sex of the healers. Since the plant habitat skill was learned at in-laws' homes by female healers where the opportunities for closer interaction with family members is limited, less interactive methods such as guided observation was used. Learning from more intimate familial sources (parents) was more direct than relatively less intimate sources (husband and in-laws). The age at which habitat skills were acquired by the female healers corresponded to the usual age at which marriage takes place in Amboli and Baripada. However, as female healers developed better familiarity with their new relatives (husbands and parents in-laws), the learning of later skills of evaluation, processing, and consultations were acquired through more interactive methods such as questioning. This research revealed that the selection of method was influenced by two factors: i) the type of the skill; and ii) the gender of the learners. An earlier study by Chand and Shukla (2003) in India also confirmed that the choice of methods by elder healers depended on the nature of skill to be taught and gender of learners. This gendered nature of TMK transmission highlights a direction for further research, namely, to examine the relationships between the choice of learning methods and the gender of learners in other forms of TEK knowledge, such as subsistence skills.

The village biologist program in Amboli and the community plant diversity register activity in Baripada provided platforms for field experience and demonstration of skills such as identification, habitat and harvesting. The problems or issues concerning use of various TMK methods should be discussed explicitly during such activities. For example, the disappearance of a rare medicinal plant like *Ragat rohida* in and around Baripada (see Section 5.2.2) was discussed in the informal network of village healers. Activities like the village biologist or the community plant diversity register should further this issue by discussing implications and alternatives for teaching knowledge of rare plants. Discussions at the local level would help to ensure the continuity of the transmission process and help to achieve conservation of rare medicinal plants.

The homes of healers and the village forests were the main sites of learning for most skills. Such sites were commonly reported in previous studies (Chand & Shukla, 2003; Daes, 1994; Ruddle, 1993). However, an idea of specialized educational programs such as bush camps (Ohmagari & Berkes, 1997) or the use of educational kits (Chand & Shukla, 2003) to promote transmission of TMK was not found in this research, with the exception of the village biologist or plant diversity register programs initiated by NGOs. In study villages, the home herbal gardens or community herbal gardens that were created by healers, and NGOs could become sites for healer-initiated public educational efforts to encourage TMK transmission.

According to the healers, the reasons for impeding the acquisition of TMK or loss of transmission were mostly related to the process of transmission itself. Incomplete transmission (transmission of few skills), failure to follow the rules of transmission by young disciples and strict enforcement of the transmission rules by the old healers were the most important reasons directly obstructing the intergenerational transmission of TMK. For the young healers who were not eligible to qualify as disciples by older healers in Amboli, the process of transmission stopped at learning the foundational skills such as identification. In contrast, young healers from Baripada advanced to learn habitat, harvesting and, to a certain extent, the application skills even though they did not qualify as disciples. The preference of the older healers to restrict their teachings only to their family members (Amboli) and the application of strict tests for choosing disciples (Baripada) were also indirectly contributing to the loss of transmission.

The process-oriented reasons (such as incomplete or poor transmission) have been cited in many studies (FRLHT, 2000, Kala, 2004; Shankar, 2004) but very few studies explained them in detail. A study by Ohmagari and Berkes (1997) is one such exception that highlighted delayed transmission or incomplete transmission to learners at a young age as an important reason for loss in transmission or erosion. One of the most common reasons identified by the current research and previous studies is the negative attitude of local formal education and modern medicine practitioners towards TMK and its practitioners. An additional insight on the reasons for poor transmission of certain skills

was provided by analysis of relative emphasis on ten identified skills by young (learners) and old (teachers) healers. Through a statistical analysis using the Mann-Whitney *U* test, this research confirmed that old healers and their disciples significantly differ from each other on ascribing importance to the crucial skills of interest, identification, rare plants, consultation and harvesting. These crucial skills are, therefore, losing their importance in the eyes of young or aspiring healers and vulnerable to being lost if their importance is not reinforced through local educational efforts.

Tapping local knowledge is critical to the success of CBC. But understanding and maintaining specialized forms of TEK such as TMK is a challenging task. For example, attention to the modes of transmission of TEK within a CBC initiative would ensure that transmission of crucial skills continues and that horizontal and vertical sources of TMK are not inadvertently broken down. As well, activities such as engaging school children in CBC may help to encourage the transmission processes. Such ways and educational approaches need to be designed and implemented at the local level so that TEK and CBC can be mutually beneficial. Biodiversity contests and recipe contests are two such environmental education approaches and they are discussed as examples in the next Chapter.

Chapter 6:

Biodiversity & Recipe contests



Process of evaluation in Biodiversity contests



Recipe contest in Baripada



Local healers and school children discussing medicinal plant conservation action plan in Amboli

6.0: BIODIVERSITY CONTEST AND RECIPE CONTEST: PROMISING COMMUNITY-BASED ENVIRONMENTAL EDUCATION TOOLS FOR COMMUNITY-BASED CONSERVATION

The mutual relationship between CBC and environmental education as discussed in Section 2.3 of Chapter 2 can be summarized and expressed in two ways: i) environmental education literature that describes CBC as a part of learning and educational strategies of the inventive paradigm (Sauvé, 1992) through community-based and socially critical environmental education which are targeted to enhance CBC; ii) CBC literature that values and considers environmental education as a part of CBC (Pagiola et al., 1998) and also as a critical learning and evaluation tool to strengthen CBC (Hackel, 1999; Kellert et al., 2000; Kothari et al., 2000).

Chapter 4 reveals an example of the first category in which two CBC initiatives used an interesting array of learning strategies and educational opportunities. Three strong characteristics exhibited by these two initiatives were particularly important: i) localness (focus on local concerns, interests and resources including knowledge); ii) collaborative learning (multiple stakeholders mutually learning by working together to solve common environmental issue); and, iii) informed action for change and empowerment. The focus on specific local natural resources (medicinal plant in RCMPCC) or conservation of local forest (Baripada), use of local human resources (community leaders, healers) and most importantly their knowledge and skills at various stages of initiatives are examples that highlight the localness feature of community-based environmental education. The collaborative learning features in both initiatives included: various group building and capacity building processes as motivated by leadership, biodiversity assessment and monitoring arrangements through village biologists or CAMP programs (RCMPCC) and the community plant diversity register (Baripada) and engagement of local healers, community leaders, members of the local management committee or the Forest Protection Committee, local staff from the Forest Department and scientists/academics from universities and research institutions in mutual learning and exchange of ideas.

Finally, local communities have also evolved criteria for evaluating outcomes of their efforts in terms of biodiversity conservation (conservation of RET species in Amboli and improvement in ecosystem services in Baripada) and human well being (improved participation and empowerment of local healers and village women). These outcomes represent elements of informed action for change and empowerment achieved through mutual learning. All three features strongly demonstrated by two CBC initiatives were also considered important features of community-based environmental education (Andrews et al., 2002; EPA, 2000).

As noted earlier, scholars have also underscored the significance of local knowledge in CBC (Berkes, 2004; Brown, 2003) and as a linked component highlight the utility of environmental education as a tool for enhancing CBC (Section 2.3), which represents the second category of relationship between environmental education and CBC. It has also been recognized that environmental education approaches at the local level will not be effective unless they build upon local knowledge and experiences (Palmer, 1998). In addition, Chapter 5 also envisaged the use of local educational approaches which could strengthen linkages among CBC, transmission of local knowledge and its practitioners. Community-based environmental education approaches can fulfil such promises, if they can be used as a tool to generate knowledge-in action or fusion of TMK and formal environmental education.

This chapter is devoted to the description of two such community-based environmental education tools--biodiversity contests and recipe contests-- in the selected field sites as envisioned by the third research objective. The outcomes of these contests are evaluated from the perspectives of the high-performing school children and women who participated in these contests. These perspectives were also assessed through features of community-based environmental education described in literature (Section 2.3.3) and in relation to overall achievement of CBC outcomes.

6.1: Biodiversity contests: working with school children

Biodiversity contests were originally designed to uncover the plant diversity knowledge of children (Chand, Shukla & Gupta, 1996; Chand & Shukla, 2003). This knowledge is often acquired through various sources including parents, community leaders and TMK practitioners. In this research, the focus was on organizing a contest that was to reveal the children's knowledge about local plants. These children exhibited great interest and enthusiasm about local plants, conservation of local plants, and the associated knowledge system (TMK). Such a community-based environmental education approach is expected to create a platform or avenue for learning so that TMK and formal environmental education can synergise to improve the outcomes of local CBC initiatives.

6.1.1: The process of the biodiversity contests

A biodiversity contest was organized on January 23, 2004, in the Amboli secondary school. An initial round of meetings with teachers was held on January 8, 2004, to discuss the idea and logistics of the contest. Pamphlets describing the contest in the local language of *Marathi* were distributed to all school children almost two weeks in advance. In addition, individual visits were made to classrooms to explain the process of participation and to seek the consent of participants. To participate in the contests, children were expected: a) to list the names of as many plants as they know; and b) to chronicle the medicinal uses of the plants. Separate meetings with the teachers were organized to assess their willingness to help organize the contest. The contest in Baripada was organized in the government residential school of Bopkel village on September, 24, 2004. In the case of Baripada, a secondary school from the neighbouring village of Bopkel (located at a distance of 6 km from Baripada) was chosen because of the absence of a secondary school in Baripada; the preference of Baripada community leaders; and the encouraging response of the school officials at Bopkel. The process of conducting the contest was the same as at Amboli. The process and rules were taught to the teachers and school children through demonstrations and meetings in September 2004.

The student participants were evaluated on four criteria: a) the number of plants listed; b) the number of plants for which uses were described; c) the presentation style; and d) a knowledge test (skill in identification, medicinal and other uses of plants and habitat). Criteria a) and b) were adjusted while ranking the performances in different grades. For instance, the highest number of plants listed with uses by any participant was considered the best performance for a given class and, therefore, was given the highest marks. The marks of remaining participants were then assigned in relation to the highest numbers of plants listed in that particular grade. The typical evaluation committee had four to five members and was comprised of a teacher, a local healer, a Forest Department staff member and a member of the local management committees or self-help groups. The participants were judged and ranked independently by all members of the evaluation committee in each class. Following the suggestions made by the local management committee members and school teachers in Amboli, the idea of children bringing plant specimens to the committee was replaced by an extended knowledge test to avoid over extraction of same species of the plants -- particularly of rare species. Local Forest Department staff provided samples of herbarium sheets, which were used to test identification skills of the participants. The winners from each class were decided on the basis of the highest mean ranks, which were calculated separately for the male students and female students. Winners were awarded prizes in the form of teaching-learning material during a special cultural event organized by the school and village.

6.1.2: Outcomes of the biodiversity contests

A total of 371 students from the secondary schools at Amboli (N=250) and Baripada (N=121) participated in the contest. In addition, school teachers (N=20), local healers (N=9) and local community members (N=21), including the members of local forest management committees and self help groups, took part in the contests as observers and members of evaluation committees. The overall participation (N=371) of school children in the contest equalled 58 percent of the enrolment (N=644) at the schools. The rate of overall participation to enrolment was slightly higher in Amboli (59 %) than Baripada (56 %). The total participation of male students from both the villages was a little less (53 %) than the female students (63 %). One of the main reasons for lower participation of

the male students in the Baripada was due to their engagement in the district-wide inter-school essay competition held outside the village. This also resulted in considerably higher participation of the female students (70 %) than male students (43 %) in Baripada. In Amboli, however, the overall participation of the male students was slightly higher (62 %) than the female students (56 percent), while the total enrolment of male students (N=203) for grades five to seven was lower than female students (N=223). The number of plants listed by students was intended to test students' skills in compiling a list of all possible plants either through their own knowledge or acquired through various sources including family members, elders and village healers.

From the complete data available from both villages (N=340), the average number of plants listed was 96. The number of plants listed by the male students was (Mean=100, N=167) slightly higher than the girls (Mean=90, N=173). In Amboli, PS, a female student in grade seven, made a list of 290 plants along with their uses and their preferred habitats, while a grade 8 male student, DG, listed 330 plants with its uses.

In Baripada, the overall number of plants listed was much less (Mean=80, N=90). The male students (Mean=105, N=41) outperformed the female students (Mean=58, N=49) so far as the plant list was concerned. GB, a male student in grade eight listed 340 plants and a grade seven female student, NA, made a list of 310 plants. On the whole, the children that participated in the contest exhibited a rich knowledge of local plants. As a follow-up to the contest, a one-day interactive forest walk/workshop guided by local healers was organized with participation of school teachers, winners of the contest, and women from self-help groups and community members. In Baripada, an educational tour in the village forest with local healers and teachers took place in which students received hands-on demonstration of skills such as identification and use, as well as habitat preferences of certain common medicinal plants.

The dialogue and display of plant lists and specimens from the contests was organized in an open space in the school or village common place. This was perceived as a useful

educational tool by students, teachers and community leaders, particularly in expanding knowledge of local plants and verification of medicinal uses of certain plants.

It is the first time experience in our schools that the teachers, students and healers have engaged in joint exploration of local medicinal plants. Local healers have a distinct sense of identifying and using the plants which can be learnt in small groups. The winners from contests have already demonstrated interest in the plants and they enjoy learning in groups. The dialogue between healers and students provides useful curricular insights into various aspects of local plants that students might be interested in (personal interview, NP, school principal, Amboli).

These outcomes facilitated meaningful interactions among students, local healers, teachers, village forest staff and community leaders who collaborated to develop an action plan for conservation and regeneration of rare medicinal plants in Amboli. The contest provided a platform for recognition of village healers and expanded the use of their knowledge in village schools.

6.1.3: Outcomes of the biodiversity contests: Children's perspectives

The winners of these contests are expected to have developed 'biodiversity competence' (Chand & Shukla, 2003) and have greater interest, understanding and knowledge through consultation with parents and healers about local plants, as per expert theory (Ericsson & Smith, 1991). In order to test biodiversity competence, a complete list of winning students with high scores was prepared at both places (N=45, Amboli; N= 36 Baripada) to facilitate selection of students for interviews. The final selection of student was done considering the following criteria: i) at least one male and one female student from each grade; ii) willingness to participate in the study; iii) availability of the student; and iv) general ability to talk and engage in conversation (as judged by the class teacher). A brief checklist was developed (Appendix D) and translated into the local language to collect the feedback of winners on the contest and its potential as a community-based environmental education tool. Each winner was personally approached by the researcher to explain the scope of the research and to clarify questions on the checklist. Finally, data

from 19 students in Amboli (Male=8, Female=11) and 22 students in Baripada (Male=10, Female=12) were collected through semi-structured interviews.

Most of the interviews were held at the students' homes. Some interviews were held at the school premises after school hours. Written consent from the school teachers and verbal consent from the parents was obtained in advance. As well, the initial responses from the interviews were compiled as statements and shared in separate small group meetings with available male and female winners who participated in interviews at Amboli (Male=6, Female=9) and Baripada (Male=7, Female=8). These group discussions helped with triangulation of data by refining the interview responses and eliciting additional responses from a group. The final set of responses can be classified under three categories: a) positive outcomes of the biodiversity contests; b) changes that can make biodiversity contests more effective; and c) future scope of action building on the biodiversity contests. These responses were also assessed by the researcher in the light of observations made during the process of organizing contests and interactions with students, teachers, community leaders and healers during contests. This assessment was guided by community-based environmental education and CBC outcomes as discussed earlier.

6.1.3.1: Positive outcomes

The positive outcomes of the contests largely reflect students' responses to the question 'Things most liked in/about the biodiversity contests'. These responses or statements were coded according to the grounded theory procedures and techniques (Strauss & Corbin, 1990). Positive outcomes of the contests in Amboli and Baripada are presented in Table 6.1:

Table 6.1: Positive outcomes of the biodiversity contests

Description of outcome	Amboli		Baripada	
	Male (N=8)	Female (N=11)	Male (N=10)	Female (N=12)
First experience in school learning about local plants	+++	++	+++	+++
Prizes/public recognition served as incentives for participation and future local conservation efforts	++	+++	+	+
New and useful information about plants gained and verified	+	+++	+	++
Sharing the photos was a good gesture	++	++	+	++
Lateral learning among students helped in reinforcing interest and collective understanding of local plants	+	+	+	+++
Documentation of plants helped in systematic understanding about medicinal uses of plants	+	+	+	++
Invitation and open-access call provided equal opportunity and encouragement to participate and share knowledge	-	+++	+	++
Questioning about local plants by teachers and healers as part of process provoked interest and enthusiasm	+++	+	-	+
Plant list was a good criteria of evaluation	-	-	+	-
Involvement of local healers helped in furthering dialogue about plants and collaboration with school	-	++	-	+
Grade-wise evaluation was a good process	+	-	-	-

Key: +++ = Perceived important by all
 ++ = perceived important by majority
 + = perceived important by some
 - = perceived important by none

The most important perceived outcome of the biodiversity contests at both Amboli and Baripada was a new self experience both by male students and female students.

When the first announcement was made in the school by the teachers and Mr Shukla, we got some interest. This interest was reinforced when we were given pamphlets detailing the usefulness of the contest and process to take place. We had discussion among ourselves as to what it takes to be a participant and how the actual contest would look like. We all were very excited by such a novel experience about the village plants which is hardly discussed in our classroom' (focus group discussion, male participants, Amboli).

For most of the students at both places, but more strongly at Baripada, the biodiversity contests provided a unique educational experience in the school. 'I never heard about

such contests before nor did our teachers. So we all were looking forward to gaining a new experience of learning about our own village plants' (personal interview, DPV, male participant, Baripada). The organization of the contests thus provided a novel experience to students and teachers to learn about local village plants--a subject matter which is generally not discussed in the classrooms as part of the formal curriculum.

The second important outcome was the importance of a prize as an incentive for participation in the contest and motivation to engage in collective action for medicinal plant conservation. This was most strongly perceived by all male students and majority of female students of Amboli, and some male and female students of Baripada.

When I read the process of participation and opportunity to get prizes, I seriously started collecting information on local plants from my grandfather and his friends who are popular healers in our village. I had decided to collect information on as many plants as I could in order to win. Now that I have won, I would help my grandfather and his friends in collecting plants and raising them in nurseries (personal interview, RA, female participant, Amboli).

Winning and recognition in the contests for these children became a motivation to engage in frequent interactions with local healers and concrete activities leading to local conservation of medicinal plants. Such an outcome can be considered useful for CBC.

I had never won any prize since I was in grade one. I am in grade seven now and when I read the announcement I thought this would be a great opportunity to prove my skills. I look forward to participating in future activities related to medicinal plants or natural resources of our village (personal interview, LG, female participant, Amboli).

In Amboli, particularly among female students, the prizes provided a boost to participate in future contests, however, they were not as clear as male students in terms of how their participation in contests could help them in achieving local conservation goals. For the male participants, 'winning prizes in public means recognition at the homes, which provided a sense of satisfaction' (personal interview, DG, male participant, Amboli).

Such an outcome is important in improving the school-community relationship, which was not healthy as indicated earlier (Section 5.5.1).

In Amboli, both male and female winners were invited by RCMPCC to a workshop to join hands with school teachers, community leaders and senior healers to shape the local conservation agenda and for hands-on learning experience from the healers.

Getting prizes in the contests makes us special achievers in the village. We engaged with local healers in the joint exploration of local medicinal plants in the forest garden, made a list of rare or extinct plant species and generated an action plan for their regeneration (personal interview, SP, female participant, Amboli).

This outcome is significant in terms of CBC outcomes for four reasons: i) contests provided an opportunity for encouragement to promote intergenerational transmission of TMK. Specifically, crucial skills like interest, identification, harvesting, habitat and rare plants (as identified in previous chapter) were reinforced and promoted; ii) the documentation of rare plants by school children which strengthens local monitoring and conservation of medicinal plants; iii) enhancing 'biodiversity competence' among high-performing school children through local healers and RCMPCC -- a resource and commitment which are easily built upon in future CBC programs; and iv) local recognition and use of healers in village-based conservation activities by RCMPCC and schools, which can improve healers' participation in existing CBC programs and reinforce the message that they are a key stakeholder in shaping and implementing the local conservation agenda. Such recognition and participation leads to empowerment of village healers--an important outcome from the perspective of CBC.

The third outcome of the contests as perceived by most female participants and some male participants from Amboli and Baripada was getting information about new plants and/or verification of plant uses that they already knew. The process of information sharing happened at three stages. The first occurred before the evaluation and in the classroom, when participants had an opportunity to interact with one another. 'When we were sitting with other students waiting for our turn, we talked about one another's list of

plants. In this process, we obtained information on new plants and their uses' (personal interview, LH, female participant, Baripada). Second, information was shared during the evaluation either through local healers disclosing new information while giving clues or hints to the questions about local plants or observation of other participants being evaluated. 'When JD (name of the healer) asked me to identify the particular plant called *Ragatrohida*, I fumbled. Even though I listed the same plant in my sheet, I had never seen it before. JD also shared some new uses of *Ragatrohida*, which provoked my interest to learn about similar new plants' (personal interview, SP, female participant, Amboli). Finally, after the evaluation, information exchange took place in two stages: i) during displays in which informal discussion on some plants took place; and ii) sharing the list of winning participants during the prize distribution ceremony. 'When LH was declared as the first winner from my class, I greeted her and asked her to share her list. I found some new plants and new uses of plants that I knew and listed' (personal interview, SC, female participant, Baripada).

The information gain or exchange is also closely related to the lateral learning outcome as perceived both by few male and female participants in Amboli, but more strongly by the female participants of the Baripada.

After reading the announcement and instructions by the class teacher, a group of female students planned a one-day picnic in a nearby forest. Two healers and one teacher also accompanied us and guided us in learning about medicinal plants in the forest. Within the group, we took turns sharing information about medicinal plants that were known. This collaborative learning was encouraged by teachers and local healers. I had some interest in plants because my father is a healer. The contest helped me bolster my interest in plants (personal interview, LH, female participant, Baripada).

The information exchange related to local plants has helped a great deal in generating interest and sensitivity among school children towards medicinal plants. These children have already acquired interest and learned about the habitat of medicinal plants – two crucial skills needed to become TMK practitioners. These children can be very useful stakeholders in the RCMPCC initiative.

For many female participants in Baripada, the contest provided an opportunity to renew their interest in plants.

The majority of male and female participants from Amboli and female participants from Baripada liked the idea of sharing the process of the contest, particularly the photos. The researcher presented a slide show at both locations, and also left a copy of a CD and album containing selected photos. When children, teachers and members of the evaluation committee saw what was done during the contest, they were excited. 'I was particularly happy to see a video clip on how some of my classmates answered the questions, including myself' (personal interview, NP, female participant, Baripada). The sharing of the photographs, particularly in Amboli, generated enthusiasm among students.

My school friends and I have seen my photo in the first-ever school activity. I used to participate in the other school activities but never had such permanent post-event memory which was shared in public. We were able to see the photos on the same day. This has made us feel that we were an important part of the biodiversity contest (focus group discussion, male participants, Amboli).

Documentation obtained from the participants' entries was considered another useful outcome by some male and female participants from Amboli and majority of female participants from Baripada.

Our class was able to compile list of more than 309 plants, their locations, growing habits and medicinal uses. The village-based Forest Department staff that was present during the contest had noted down some of this information to update their herbarium sheets. I think one could think of several possibilities to use such useful documentation in the classroom (personal interview, GG, male participant, Baripada).

Most female respondents from Baripada acknowledged that the contest provided useful orientation on how to look at local plants.

We knew many plants from our parents or *gurus*, but had never studied plants in such a systematic manner. Now when we come across the new plants, we tend to classify them using the framework used in the contest such as name, location, uses, and growing habit to understand that plant (personal interview, SSP, female participant, Baripada).

The documentation helped in enriching the existing information-base on local plants, which is useful in improving monitoring by the Forest Department and the Forest Protection Committee members in Baripada. The process of documentation by children also re-established the importance of certain skills such as interest, identification, and habitat of the plants.

All female respondents from Amboli and the majority of female respondents from Baripada were very happy about the way in which the contest provided an equal opportunity to participate.

We were able to participate even if we brought a single name entry. This was made very explicit in the announcement and we appreciated this broad condition for participation. Some of us who generally shy away from public functions or school contests were not intimidated by this announcement. Even if one does not have good knowledge of plants offhand, one could learn from family members and village elders to participate (focus group discussion, female participants, Baripada).

‘For me, the best thing about contest is not that I could participate equally with male students but could also surpass them to win the best students’ performance at school level (personal interview, SG, female participant, Amboli). While female respondents from both villages were considered as equal participants, the male respondents from Amboli were silent on the value of a contest. Some male respondent from Baripada, however, did perceive this outcome as a useful one. In Baripada, such a gesture by male participants could be welcomed from the perspective of improving women’s participation in village-level conservation related matters. Such a lesson is also helpful from the CBC’s human

well-being outcome in which participation and empowerment of local women was emphasized.

The next set of important outcomes concerns the process of evaluation that was used in the contest. For instance, some male respondents from Amboli liked the idea of grade-wise evaluation and some from Baripada considered inclusion of plant list criteria as a good test criterion. The quiz or questioning about local plants as part of evaluation was highly appreciated by male respondents from Amboli, and some female respondents both from Amboli and Baripada. The female respondents in general were indifferent about the criteria of evaluation used in the contest. However, they were very positive about the involvement of healers in the contest, particularly in Amboli.

Our village healer, JG, was known to school teachers but I think it was the first time that an illiterate healer like JG could sit in the same chair with our well-educated teachers as the member of evaluation committee. JG was also later consulted by the school teachers and administration about the selection of plant species that could be raised in the school garden (personal interview, RA, female participant, Amboli).

Such an outcome is important in reviving positive relationships between healers and school teachers in Amboli. The mutual respect between teachers as formal knowledge practitioners and local healers as informal knowledge practitioners is a step forward in strengthening TMK transmission and achievement of CBC goals. In contrast, some male respondents from Amboli liked the idea of grade-wise seating and evaluation.

The grade-wise evaluation helped in smooth functioning and objective evaluation. It also discouraged students from copying the names of plants from others, as the evaluators had better control over the class. However, I did not like way in which students were seated on the benches. I think students should have sat on the floor, because some of them had brought plants and others could experience those plants conveniently while seated on the floor (personal interview, DB, Amboli).

6.1.2.3: Suggested improvements in biodiversity contests

Through semi-structured interviews, data were also collected on changes or improvements that participants would like to make in future biodiversity contests. These changes are described in Table 6.3.

Table 6.2: Suggested changes in biodiversity contests

Suggested Change	Amboli		Baripada	
	Male (N=8)	Female (N=11)	Male (N=10)	Female (N=12)
More active involvement of healers in evaluation	+	+++	++	++
Clues and hints should be provided during evaluation (e.g. quiz on rare plants)	+	++	++	+
Preparation time and efforts (by teachers) were insufficient	+	+++	++	+++
The seating arrangement was not conducive	-	+	+++	+++
Award/Special Prizes process generated discomfort	-	+	++	-
Teachers knowledge of plants inadequate	+	-	+	-
Number of plants brought should be included as an evaluation criterion	++	-	+	-
Students should have been asked to read their entry	-	-	++	-
Grade ten students and some teachers could not take part	-	-	++	+

Key: +++ = perceived important by all
 ++ = perceived important by majority
 + = perceived important by some
 - = perceived important by none

Most of the suggestions offered by the winning student participants are related to the process of evaluation. The majority of male and female respondents from Baripada mentioned that local healers' involvement should have been more active, particularly in the process of evaluation.

We have some competent healers and they could better design the quiz about local plants or bring some plants for testing students' knowledge, such as identification. In fact, these healers can also provide some additional information on plants students already knew and can make the evaluation process more interactive and interesting (personal interview, SM, female participant, Baripada).

The importance of plant identification and closer involvement with local healers emphasized by participants are important considerations in promoting transmission of TMK and outcomes of CBC. Most female respondents in Amboli thought the same way for a different reason. 'We could have involved more women healers in the process of evaluation. Female students could have better communicated with them and village women healers would have got public exposure in school' (focus group discussion, female participants, Amboli). By improving the participation from women healers in contests, it is a step forward to promoting achievement of the human well-being goal of women empowerment in CBC. A closely related suggestion in favour of active involvement from healers was the lack of adequate knowledge about local plants exhibited by teachers, as perceived by some male respondents from Amboli and Baripada. 'Our teachers were not well versed with local medicinal plants because some of them stayed far from the village in other towns. They might not have adequate knowledge of local plants' (focus group discussion, male participants, Amboli). Most of the healers from Baripada and Amboli were illiterate and could exert very little influence in the evaluation of participants in terms of assigning marks on the basis of what they had written down. However, it was through quizzes or the testing of knowledge through questions where they mostly intervened.

Another important suggestion concerning the evaluation is the process of evaluation itself. A good number of male and female respondents from Amboli and Baripada agreed to a certain degree on the way knowledge was tested through quizzes. For some, it was a new educational experience and, therefore, deserved some support from the members of the evaluation committee.

Some of the rare plants that the judge asked me about were new to me. I have never seen or heard of these plants before and remained silent. The judges then decided to move on and asked me a question of a commonly occurring plant. Even though I did well in the quiz, I felt the judges should have provided more information about size, shape and characteristics of the rare plants about which they asked me earlier (personal interview, LGG, female participant, Amboli).

Valuing rare plant information in future contests reaffirms the importance of learning about conservation in the minds of students. Such learning of rare plants was also emphasized in TMK transmission by local healers.

The test of knowledge was subjective and much depends on the constitution and knowledge level of evaluation committee members themselves. The questions on uses were difficult, because we could identify most village plants but might not know all uses of these plants. I wish the judges could have been friendly in asking about plants that we know rather than what they know (personal interview, GG, male participant, Baripada).

The suggestion of the respondents from Baripada that the school teachers and local healers should jointly design a common set of questions for each class might help in improving the student's performance on knowledge testing. Such collaboration would also help in developing positive relationships between TMK practitioners (healers) and formal environmental education practitioners (teachers). Interestingly, a criterion of bringing plants and their parts was suggested by a majority of the male respondents from Amboli and some from Baripada. 'I do not know why our community leaders and NGO representatives removed the criterion of bringing plant or parts in the contest. I think we could have adhered to that original idea of the contest, instead of overemphasizing the plant list criteria' (personal interview, JP, male participant, Baripada). Another suggestion that came from male respondents of Baripada was to read out a summary of entries and highlight special plants by the participants in front of class, so that everyone would know who listed how many plants and what special efforts were made.

While all contest participants received a token gift for participation, the majority of the male respondents from Baripada and some female respondents from Amboli did not like the idea of giving special prizes to deserving candidates for different reasons. In Baripada, a few students won double prizes: first for their class performance and second as a special prize for their outstanding overall performance in the school. 'Rather than giving two prizes to the same individual, the number of winners from each class could have been increased and only one special prize should be given to the most outstanding

male student and female student from the school' (personal interview, DP, male participant, Baripada). In Amboli, some female students were apprehensive about giving special prizes to only one or two participants per class. 'Like other contests, winners are rewarded with special recognition, which might have made some of my friends sad who could not win. I think we all demonstrated good knowledge and enthusiasm to learn about medicinal plants and should equally be appreciated (personal interview, DB, female participant, Amboli).

The second set of suggested improvements are not directly related to evaluation, but are targeted towards the conditions or factors concerning participation and, in some ways, the performance in the biodiversity contest. The most important among them is the lack of time and lack of effort in preparation and follow-up (by teachers) as perceived by most female and some male respondents in Amboli and Baripada.

Now we are clear about the expectation in the contest. More time could have helped improve our performance in the contest. We live in residential schools and more time would have given us the opportunity to go back to our home and consult with our village healers' (focus group discussion, male participants, Baripada).

The students, particularly in Baripada, seemed to have been accustomed to having longer preparation time for most school-level contests and they were also expecting the same for the biodiversity contest. 'Generally we are given at least a month's time to prepare for school-level contests. Contests such as this would probably need extra time to prepare -- more than a week or two (personal interview, KM, male participant, Baripada).

All female respondents from Amboli and Baripada, on the other hand, believed that their teachers did not spend enough time and effort to improve students' participation in the contest. 'I wish our teachers could have helped us with how to prepare a systematic list through examples rather than simple instructions. They should also take us around and talk about plants to sustain our interest and enthusiasm in medicinal plants' (personal interview, SM, female participant, Amboli).

After the general announcement in the prayer hall, teachers were expected to provide detailed instruction on the process and the rules of participation. Most teachers provided information but did not encourage us to ask questions. The participatory follow-up by teachers could have improved our performance in the contests (focus group discussion, female participants, Baripada).

The majority of the male respondents from Baripada and some from Amboli also expressed the same concerns about the lack of enthusiasm by their teachers.

We were not properly guided in making the list of plants, which resulted in participants coming up with different sets of formats, making the evaluation a bit difficult. Teachers could have checked the lists of all participants in their respective class at least two days prior to the contest. This could have resulted into better participation and faster evaluation (JP, male participant, Baripada).

Physical arrangements for the contests also affected participation in some ways. All male and female respondents from Baripada expressed their general dissatisfaction over seating and other logistic arrangements during the contest.

I think rather than grade-wise seating, we should have mixed a few classes and made them sit as a group. The groups should be seated in adjacent areas. The learning that might have happened within and between groups would have been far more enriching and interesting than grade-wise seating (focus group discussion, male participants, Baripada).

‘I think sitting together would help students informally check and learn about each others’ list of plants. Their knowledge of local plants would be expanded through such collaborative learning opportunities’ (personal interview, VP, female participant, Baripada).

6.1.3.3: Follow-up activities: Learning for improving community-based conservation

The student participants outlined a range of activities that can be organized as a part of the follow-up for the contests. Most of these activities, as highlighted in Table 6.3, are school-based and require active participation of both village and school communities. In

general, there was agreement among all respondents about making the biodiversity contest a regular school activity more frequently. The male and female respondents from Baripada and the female respondents from Amboli in particular, unanimously felt the need for a regular organization of the contest, at least three times a year.

We think that organizing contests three times a year will help sustain the interest of students, teachers and schools in the activity. It will also provide an opportunity to interact with and learn about the plants from our elders and family members (focus group discussion, Baripada, male participants).

In Amboli, the female respondents wanted to have three contests per year for a different reason. 'Organizing three contests each in the months of winter, summer, and monsoon would help us capturing different types of vegetation' (focus group discussion, female participants, Baripada).

Table 6.3: Participants' suggestions on post-contest activities

Suggested Follow-up	Type*	Amboli		Baripada	
		Male (N=8)	Fem. (N=11)	Male (N=10)	Fem. (N=12)
Contest to be organized more frequently and regularly	PR	+	+++	+++	+++
Similar contests on home herbal gardens/ schools garden /villages	PR	+	+	++	++
Similar contests among local healers and teachers	PR	+	+++	++	+++
<i>Panchayats</i> and other village institutions/schools should be involved(a)	PR	++	++	+	+++
Thematic charts/ herbarium should be developed as educational material(b)	PI	++	+	-	-
Debate/essay writing on local medicinal plants(b)	PI	-	++	+	++
Weekly study meetings or periodic workshops among interested students by teachers/healers(b)	PI	-	+	+	++
Teachers should summarize key outcomes and relate it to classroom teaching(b)	PI	+	-	-	-
Contributions of local healers and plants should be highlighted in curriculum(b)	PI	+	++	+	++
Local language booklet on important plants for classroom teaching and village use(c)	PA	+	++	-	++
Planting of local medicinal plants in school garden/home/village(c)	PA	++	+++	+	++

Key: +++ = perceived important by all
 ++ = perceived important by majority
 + = perceived important by some
 - = perceived important by none

Note: PR, PI and PA denote various categories within which a given follow-up activity may fall.

a) PR= Suggestions concerning the process of contests; b) PI = Suggestions that are targeted for pedagogical enrichment/improvement; and c) PA = Suggestions that lead to positive action.

Another important activity suggested by respondents was similar contests among local healers and school teachers. This idea was strongly endorsed by the female respondents from both villages and the majority of the male respondents from Amboli. 'I think we should have contests among healers about the different plants they know with a different method emphasizing demonstration of plant specimens. Such an idea could help us identify who is best in treating which sort of diseases' (personal interview, MP, female participant, Baripada). The idea of biodiversity contests among teachers seemed to have been more preferred by male than female respondents. Male respondents from both places commented about 'inadequate knowledge of the teachers' during evaluation. 'Such contests among teachers would demand extra efforts in improving teacher's knowledge and that might be useful in the better evaluation in students' contests' (personal interview, DG, male participant, Amboli).

Despite the gender-based differences in preferences, biodiversity contests have helped students envision the idea of contests among teachers and healers as an interesting community-based environmental education activity. The majority of male and female respondents from Amboli also suggested more active involvement of local panchayat leaders and village institutions such as schools from other villages as an important follow-up activity. 'Once we gain some experience in these contests, we should have inter-school contests within the district' (personal interview, LH, female participant, Baripada). The collaboration with village institutions is mostly based on and linked to the action-oriented follow-up suggested in category PA. For instance, a suggestion of the planting of common medicinal plants by school children in the *panchayat* owned land was offered both by the male respondents of Amboli and the female respondents from Baripada during focus group discussions. This would require the involvement of and consultation with *panchayat* leaders, school teachers, students and school administrators. Once successful negotiations and agreement over issues such as the selection of land,

selection of species and access to and use by village community are achieved, the students can experience what it takes to cultivate medicinal plants.

Organizing a follow-up co-curricular program was suggested to enrich the existing classroom practices and to improve the existing curriculum. Debates and essay writing contests on local medicinal plants are more structured activities that can be easily organized as co-curricular programs in school. Summarizing the outcomes of contests by teachers, or making educational charts of plants are new activities that emerged directly from the contest.

Each class teacher should briefly update the class about how we went about the contests. Teachers should also present statistics about total numbers of plant species that were compiled in our class and who came up with the list with the most numbers. Finally, teachers should give us some information about the most common and rare medicinal plants and link the list to the topic of conservation that we study in science (personal interview, AB, female participant, Amboli).

Preparation of herbarium sheets or educational charts according to therapeutic uses was also perceived as a useful co-curricular activity, particularly in Amboli. Some male respondents from Amboli and Baripada and the majority of female respondents from Baripada preferred to have debates, write essays or hold study circles about local medicinal plants.

Almost all male respondents and all female respondents suggested enriching or improving the existing curriculum by incorporating information about plants compiled from the contests and local healers.

The learning about different shapes and sizes of plant parts through textbooks should be explained with local medicinal plants that children see every day in the village. We should also include information about local healers and how they use and conserve medicinal plants. The village healers should be periodically invited as guest speakers to demonstrate how they make herbal remedies from plants in school (focus group discussion, female participants, Amboli).

‘We should restructure our annual picnic program and integrate forest walk sessions with teachers. Such forest walks should be guided by the healers and will help in developing sensitivity and raising awareness about local medicinal plants (SKG, female participant, Baripada).

Action-oriented follow-up activities mainly included planting efforts at school, in the village or at homes. The school in Amboli made systematic efforts to raise medicinal plants in the small place available such as the school garden. The Bopkel School where contests for Baripada were organized already has a developed school garden featuring some medicinal plants. Documentation of medicinal plants was another important activity that was suggested more strongly by female respondents.

We should document all available plants and their uses. The rare plants should specifically be mentioned so that villagers and students would not pick those plants deliberately. Documents should be kept both at school and *panchayats* and be updated in consultation with village healers (Focus group discussion, female participants, Baripada).

Students’ preference for planting and documentation of local medicinal plants, including rare plants, suggested that they are not only interested in knowing about the plants but also want to be involved in concrete actions for their future conservation and regeneration.

Various follow-up activities were suggested in three categories; process of contests, enrichment of existing formal environmental education practices, and initiating action-oriented village-based activities. These activities have strong implications for promoting local conservation and TMK transmission. Organizing biodiversity contests more frequently within the same village or contests among healers and teachers indicate that contests are important environmental education tools, which can improve outcomes of CBC directly and indirectly by promoting TMK transmission as discussed in Section 6.1.3. Reorienting existing formal environmental education practices such as the school curriculum, and non-formal co-curricular activities such as school picnics through active involvement of medicinal plants and local healers is a positive way to build stakeholder

involvement to TMK transmission methods and local conservation efforts (such as RCMPCC and Baripada Forest Protection Committee). Action-oriented activities initiated after contests exhibit the collaborative commitment of local stakeholders such as students, teachers and school authorities. By planting local plants in the school garden and focusing on documentation, conservation and regeneration of rare plants as follow-up activities indicate strong desire of students to engage in learning and action that promote local CBC outcomes.

6.2: Recipe contests

6.2.1: The process of the recipe contests

The process of organizing the recipe contests was the same in both villages. The idea and methods of participation were conveyed to the village women through local language pamphlets, small group meetings with community leaders, and members of self-help groups and the local management committees. The members of self-help groups and the local management committees provided useful feedback on organization (e.g. logistic arrangements and timing of contests) and expressed their willingness to follow up with village women to encourage their participation. Interested members from self-help groups and local management committees were also involved in the evaluation committee. The recipes were evaluated on the basis of following criteria: a) number of recipes brought; b) number of ingredients/plants used in the recipes; c) taste; d) significance of recipes (medicinal or/and nutritional value); and e) use of uncommon/ wild plants in the recipes. Participants were graded based on these criteria. Four to five evaluation committees, depending upon the expected numbers of participants were formed consisting of three members. The typical evaluation committee included: a local woman healer; local NGO representative; community leaders; school teacher; members of self-help groups, the local management committees and the village *panchayat*. Each committee had a variety of candidates from these six types that were available locally.

On the day of the contest, participating women and female students brought the dishes prepared from the recipes, with written descriptions on methods of preparation. After

registration, the participants were randomly sent to the evaluation committee with their recipes. Once individual evaluation was completed, participants displayed their labelled recipes in a large classroom or hall of the school. The evaluation took almost three hours, followed by a half-an-hour community lunch program in which all the dishes were included. The committee members also gathered informal feedback (such as taste of the dishes) from community leaders and villagers. The committee members then finalized their evaluation and passed it along to a senior community leader or healer and a village school teacher who were independently observing the whole process. The average marks for all participants were calculated and top ten highest scorers were chosen as the winners. Winners were rewarded with the prizes in the form of kitchen utensils and certificates from a senior official from the Forest Department and village community leaders.

6.2.2: Outcomes of the recipe contests

More than 87 (N=42 in Amboli, N=45 in Baripada) females participated with 153 recipes (N=57 in Amboli; N=96 in Baripada). Besides female residents, the contest elicited participation of local community leaders (N=6 in Amboli; N=7 in Baripada) local healers (N=6 in Amboli; N=8 in Baripada), school teachers (N=3 both in Amboli and Baripada) and village youths (N=9 in Amboli; N=10 in Baripada). The range of recipes/dishes included: a) unknown wild and/or known plants; b) new recipes from known plants which have either nutritional or medicinal values; c) known recipes with wild plants as ingredients (spices or as a separate addition for taste or flavour purposes); and d) known recipes/dishes and different methods of preparation emphasizing the use of locally-grown wild or lesser-known plant-based ingredients. Although most female participants brought one recipe/dish, the number of plants used in the recipes in some cases went beyond 30, in one case up to 42 in Amboli. Many participants were surprised by the nature and variety of different wild plants, some of which were looked upon as 'weeds' but turned out as having great local medicinal and nutritional values. Even though some of the recipes/dishes were the same and commonly known, their methods of preparation, tastes and uses--nutritional and medicinal-- were distinct.

The display of recipes/dishes provided an opportunity for informal knowledge exchange. The participants shared their recipes in spontaneously formed interest groups of village women and men. Following the feedback from villagers, the evaluation was slightly modified in Baripada with more weight on two criteria: taste and number of recipes/dishes. In the earlier contest, emphasis on testing knowledge and ranking based on medicinal/nutritional value of the plants restricted the scope for village-wide sharing and exchange of knowledge about common and uncommon local wild plants.

Considering the interest, more time was devoted for horizontal exchange (between female participants) and interactions among villagers about the recipes in Baripada. The local healers (both male and female) had final authority in deciding the ranking in the case of similar performance of two participants. In case of a tie, the winner was decided by the healers' opinion on the medicinal or nutritional values, local availability and the conservation status of the wild plants used in the recipes. For example, a wild plant locally known as *Nargoot* is not commonly available in and around Baripada and women had to walk deeper (22 km) into the forest to locate such plant species. Recipes with such locally unavailable and rare plants were ranked higher in the evaluation. Most of the women who participated had learned these recipes either through their mothers or close relatives, who were in most cases females. In addition, they widened their knowledge about plants through informal networks with other female healers in and around the village known through their personal contacts and informal conversations during their domestic chores in the forest. Deriving inspiration from these contests, the local self-help groups of Amboli and RCMPCC decided to organize recipe contests in different seasons to capture the seasonal variability and availability of wild vegetables. In Baripada, the enthusiasm and positive feedback from villagers motivated a local NGO, Janseva Foundation to organize the recipe contest on an annual basis.

6.2.3: Outcomes of the recipe contests: Participant's perspectives

This section describes the feedback of the women winners on the recipe contest. From the list of 29 women winners (N=14 from Amboli and N=15 from Baripada), 17 women (N=8 from Amboli; N=9 from Baripada) were selected based on following criteria: i)

availability for interview; ii) willingness to participate in research. The data from women participants were collected through semi-structured interviews using a checklist (Appendix 4) following the contests. The responses were tabulated and shared in small group meetings at both locations. These group discussions helped in verification of the interview responses. These responses are categorized under three main headings: a) positive outcomes of the recipe contest; b) suggestions for improvement in recipe contests; and c) school-based or village-based post-contest activities. These responses were supplemented by the researcher's observations made during the process of organizing contests and interactions with participants, local healers, community leaders and community members functioned as evaluation committee members. This assessment was guided by community-based environmental education and CBC outcomes, as discussed earlier.

6.2.3.1: Positive outcomes of recipe contests

The positive outcomes of the recipe contests are the actual effects or positive changes in terms of gaining new experience, interest, or knowledge, and in some cases motivation resulting from the recognition of women's knowledge in the village. The responses to the question of 'things most liked in/about the recipe contests' were coded according to the grounded theory procedures and techniques (Strauss & Corbin, 1990).

Table 6.4: Positive outcomes of the recipe contests

Outcome	Amboli (N=9)	Baripada (N=15)
Revelation and exchange of different uses of plants through recipes	+++	+
Women's knowledge recognized first time in public	+++	+++
Participation of women encouraged in village-level activities	+++	++
Platform for collaborative learning among male and female community members, children, teachers and community leaders	+	+++
Knowledge of new medicinal plants and their locations gained	+++	+
Encourages intergenerational transmission	++	++

Key: +++ = perceived important by all
 ++ = perceived important by majority
 + = perceived important by some
 - = perceived important by none

All female respondents from both villages considered 'public recognition' as the most important outcome in the contest. In Amboli, females had prior exposure in village development activities through their participation in the local management committees and self-help groups due to efforts of RCMPCC. The contest, however, provided an opportunity to bring forth women's knowledge in both villages. 'We were very happy to receive a certificate and prize from the top district official from the Forest Department. I think this is the first instance in the village where village women were honoured before male healers and community leaders' (personal interview, CN, participant, Amboli). In Baripada, the women respondents were happy that a particular aspect of their knowledge was recognized by the village.

Most male healers and villagers appreciated and used our knowledge in midwifery and processing and marketing of herbal medicinal plants. Our knowledge of medicinal and nutritional uses and location of plants and some of the wild vegetables have given us a different kind of recognition in the village (personal interview, participant, Baripada).

Many women respondents from Amboli and Baripada indicated that after getting public recognition through recipe contests they are now being consulted and involved in conservation and development activities by community leaders and NGOs. In Amboli, most women winners occupied leadership positions in the self-help groups. 'In the past, we were not even asked to contribute to any discussion on medicinal plants. Now, we are being invited to participate in workshops or consultations related to medicinal plants or women's health in the village' (personal interview, AS, participant, Amboli). The recognition of women's knowledge in general and particularly of winners generated new opportunities for improved participation of women in various village development and conservation activities. Such participation and representation of women and recognition of women healers are important indicators of women's empowerment in CBC initiatives CBC (Chapter 4). The recipe contest can thus be a potential environmental education tool for enhancing human well-being outcomes of CBC initiatives of RCMPCC and Baripada Forest Protection Committee.

The process of recipe contests involved the participation of students, youth, Forest Department staff, community leaders, and teachers. Most of the students, teachers and educated youth helped in the evaluation of recipes (asking questions, preparation of mark sheets, etc.), while community leaders and healers provided useful inputs on taste and medicinal and/or nutritional values of the recipes. The members of self-help groups and the local management committees helped in advertising the event in and around the village. The participation of village youth, community leaders and school teachers as evaluators provided a chance for systematic interaction regarding plants of common interest. Many village leaders and students asked specific information about the location and usefulness of the plants during evaluation. These interactions were very useful in generating collective ideas about some of the medicinal plants in and around the village, particularly in Baripada.

This is the first opportunity for several of us to participate and engage in discussion about our own knowledge about local plants. We have not only benefited from the interaction during evaluation but also with other participants by the sharing and exchange of information about the plants used in the various recipes that were displayed (personal interview, KR, participant, Baripada).

Opportunities for dialogue and collective learning were identified and used by the participants, community leaders, students, and teachers during evaluation and after the contest through displays. Recipe contests created a platform for collaborative learning, where formal (students, teachers) knowledge holders and TMK holders (healers, community leaders) can interact and mutually learn. Such learning and knowledge generation are very important tools for strengthening the outcomes CBC initiatives.

Another important outcome of the recipe contests was the gain in and exchange of new knowledge about local plants and recipes. This was expressed strongly in Amboli.

We learned new recipes and new uses of plants. For example, those who suffer from kidney stone problems are often advised to drink the extract of the seeds of the *Kurdu* plant. I use *Kurdu* leaves as vegetables but this is the first time I have

heard that the seeds are also useful medicine (personal interview, SG, Amboli, participant).

The participants in Baripada were benefited by learning new locations and new plants. 'The wild leafy vegetable of *Mokha* is known for its use in treating severe headaches. During conversations with other participants, we obtained useful information about its possible locations within and outside the village' (personal interview, VC, participant, Baripada). Some respondents from Baripada acknowledged that knowledge gained from other participants about the rare medicinal plants, such as *Ragatrohida*, might not be useful in recipes but still hold as good knowledge of herbal remedies for treating sprains or small bone dislocations or fractures in cattle and humans. Recipe contests thus helped in learning about identification, habitat and knowledge of rare plants – all of which are critical in transmission of TMK, as established by Chapter 5.0.

The contest also offered good opportunities for intergenerational transmission in both villages. The majority of respondents from both villages acknowledged mothers, mothers-in-law, and neighbours as important sources from which they learned their recipes. The intergenerational transmission also took place during the contest, particularly while the recipes were displayed and many young women and female students tasted different recipes, along with collecting information from the participants.

Many female students approached us after the contest in order to verify their recipes and obtain new recipes. For them, we are the champions of local plant-based recipes and we also enjoy such a gesture and would welcome interested village youth, who wish to learn more (personal interview, AR, participant, Amboli).

The interest to acquire knowledge of local plants, particularly their medicinal and nutritional values, along with deliberate efforts to consult elder women by the young participants, facilitated the process of intergenerational transmission. Many important TMK sources of learning were thus identified and consulted by the participants, which is an important outcome in encouraging TMK transmission.

6.2.3.2: Suggested improvements in recipe contests

The changes suggested for improving the design and delivery of the future recipe contests are presented in the following table.

Table 6.5: Suggested changes in recipe contests: Participant's feedback

Suggested changes	Amboli (N=9)	Baripada (N=15)
Poor communication about participation	+++	++
Participants' knowledge should be tested in forest	++	+++
Seasonal variation could not be captured	++	++
Timing of the contests prevented some women from participating	+	+
Some women did not share the names of plants during display	-	++
More weight should be given to medicinal or nutritional values of the recipes	++	++
More weight should be given to uncommon or rare plants	+	+
Lack of time in preparation	++	-
Decoration or arrangement of recipe criteria should be less valued	++	-
Evaluation on knowledge should be thorough and not random	++	+
Parallel evaluation distracted the process	-	+

Key: +++ = perceived important by all
 ++ = perceived important by majority
 + = perceived important by some
 - = perceived important by none

The types of changes suggested by the participants can be divided into two categories: a) changes concerning participation; and, b) changes concerning the evaluation. The changes concerning participation are those that might directly improve the process of participation. The most important changes include: consistency in communication in oral and written announcements, organizing contests in the forest, and increasing the frequency of contests to include vegetables in all seasons. Most respondents from both villages agreed that they received and interpreted the messages regarding participation differently.

What I read in the pamphlet was an invitation for us to make recipes from wild plants. However, some winning recipes had not just plants but also other stuff such as eggs, fish and/or cereals. I think making recipes from plants and other ingredients was not clearly spelled out in pamphlets (personal interview, SSR, participant, Amboli).

In Amboli, this might have happened because different self-help groups took responsibility for ensuring participation through group meetings in different hamlets at their convenience, with or without facilitation by the researcher. In Baripada, however, most meetings about participation were facilitated by the researcher, which helped in clear communication about participation.

The criterion of knowledge testing through the quiz was something very new for most women. 'We thought we would present our recipes and talk about the ingredients and process, but the judges spent most time in tasting our recipes and asking questions about other wild plants and their medicinal uses instead' (personal interview, SP, participant, Baripada). The timing of the contests and lack of time for preparations were perceived as hurdles by some women who could not participate due to prior commitments for domestic and agricultural purposes in Amboli and Baripada.

The respondents of Baripada strongly suggested changing the process to improve participation.

A group of participants taking judges to the forest will provide an opportunity to test knowledge in the wild and also to better understand the context of specific knowledge about the plants, such as preferred habitat, sacred value of plants. The forest as a site can also encourage discussion and exchange of knowledge about different plants that they will encounter in forest (personal interview, MP, participant, Baripada).

Baripada respondents also wanted a process of participation more inviting so that 'women can freely disclose plant names and detailed information about their uses' (personal interview, VM, participant, Baripada). This type of suggested change in future recipe contests implies how certain skills and sites of TMK transmission perceived important by women participants can be woven into recipe contests.

The second set of suggestions is related to changes in the evaluation process and criteria of evaluation. The most important suggestions included giving more weight to medicinal values or rare plants and a thorough process of evaluation. Such consideration is

important both for encouraging learning about rare plant as a valuable skill and motivating more women and other community members to learn about local rare plants, which is also a priority for CBC initiatives like RCMPCC. The medicinal or nutritional value of plants used was emphasized as being an important criterion for the evaluation. The majority of respondents from both villages felt that such a criterion should be valued higher in the process of evaluation. 'The outstanding winner should be the one who used or demonstrated knowledge of a variety of plants having medicinal or nutritional properties and not who brought most recipes' (personal interview, SSR, participant, Amboli). In Amboli, the majority of women did not like overemphasizing arrangement or decoration as a criterion of evaluation. 'While decoration has an aesthetic appeal and is important, there are other more important things such as medicinal values. Not all women can afford to buy vegetables from the market to garnish their recipes' (personal interview, AR, participant, Amboli).

The random process of evaluation was not appreciated by the majority of respondents in Amboli; there was appreciation, however, by some in Baripada. 'After we reached the venue and displayed our recipes along with others, judges started picking the recipes randomly for testing our knowledge. Many times they also picked recipes brought by other participants, leaving little scope for some of the recipes less-thoroughly examined' (personal interview, SG, participant, Amboli). A thorough process of evaluation of all recipes brought by the same participants was preferred. In Baripada, the parallel process of evaluation was considered as distractive by some respondents.

6.2.3.3: Suggested follow-up activities in recipe contests

The responses of winners on follow-up activities can be grouped into two categories: a) school-based activities; and b) non-school based activities. All except one respondent (N=9) from Amboli and all the respondents (N=14) from Baripada unanimously agreed that teaching school children about plant-based recipes is the most important follow-up activity that should be taken up at upper-primary grade level (grades 5-7). Most respondents from Amboli (N=7) and one-half from Baripada (N=8) preferred to have school-based co-curricular activities to promote an exchange of knowledge about the

recipes containing local or wild plants. Such an activity is explicitly supportive of the TMK transmission process through generation of interest among students, and it motivates them to learn about local plants through interactions with TMK sources such as family members, community leaders and NGOs such as RCMPCC.

The most common school-based activity suggested by respondents from both villages was teaching about common medicinal plants either through the curriculum or by inviting local healers as guest speakers.

We should first impart general information about recipes that can be made from local plants and wild edible vegetables in the classrooms. Once children develop some interest, we should disclose their medicinal and nutritional values by taking them to the forest or through a demonstration by local women healers (personal interview, AS, participant, Amboli).

In Baripada, most respondents preferred to have additional local reference material available on recipes of local plants.

We should have recipe books in a simple local language. Such books should describe local uses and detail processes of making such recipes. Teachers should use such books in the classroom when references are made in textbooks about local or wild plants, or during teaching of topics like biodiversity, wild plants, forest flora, etc. (focus group discussion with winners, Baripada).

The majority of the respondents from Baripada and one from Amboli recommended conducting outside school activities to teach children about recipes and local plants.

I teach my daughter and her other school-going friends informally at home. When we chat with our neighbours in the afternoon, we discuss upcoming local festivals and what specific dishes to make. We also discuss the process of making these recipes with our daughters and female students from neighbourhood. Such knowledge would be useful in places like Baripada when access to modern medicinal facilities is restricted (personal interview, BMK, participant, Baripada).

Such processes of horizontal sharing of TMK are useful in preventing erosion of TMK.

In general, respondents from both villages have a general agreement to teach about local plants and recipes to school children. The only exception was a respondent from Amboli who feels, 'Children at the younger age neither have adequate knowledge of, nor appreciation for, the local plants, and only a skilful and experienced person should teach about medicinal values of plants after they pass from primary school to the much advanced stage of secondary school' (personal interview, AR, participant, Amboli). Recipe contests are envisioned as a useful platform through which school-based formal environmental education, students, teachers and TMK holders, particularly women, can engage in mutual capacity building. This platform can also be used to replicate some skills such as identification and habitat and TMK learning methods such as practical demonstration by local healers.

6.3 Chapter summary and discussion

Biodiversity contests and recipe contests were used in this study as environmental education tools or approaches that can potentially create 'knowledge in action' (Blaike et al., 1997) and enhance community-based conservation initiatives. The outcomes of these contests were assessed in two ways: i) using the features of community-based environmental education features (as discussed in Section 2.3, Chapter 2); and b) using the overall performance of these contests in improving the outcomes of CBC including strengthening of TMK.

The contests exhibited all four characteristics of community-based environmental education: i) local focus; ii) collaboration among various actors; iii) informed and active learning; and iv) positive action for change (Andrews et al., 2002; EPA, 2000). During the organization of these contests, the use of local languages and dialects (*Konkani* in Amboli and *Arani* in Baripada), local community leaders, and local schools and youths in the evaluation resonated well with the local focus as in effective community-based environmental education. Above all, these contests made more explicit use of local knowledge systems such as TMK and its practitioners (healers), which is considered as an enabling condition in successful CBC initiatives (Berkes, 2004; Brown, 2003; Zimmerer, 2000).

In terms of collaboration, these contests sought continued participation of a range of stakeholders (students, teachers, community leaders, and women) at various stages including planning, organizing and evaluating. The dialogue and display components of the biodiversity contests (Section 6.1.2) and recipe contests (Section 6.2.2) constituted important processes where collaboration among participants, between participants and evaluators, and among other community members was evident. Some of the participants' perceived outcomes of the biodiversity contests were lateral learning among students, systematic documentation through consultation with healers and teachers, which provided equal and open opportunity to participate (Section 6.1.3.1). Similarly, the recipe contest enhanced intergenerational transmission among women (daughters-parents/family members -grandparents) and public recognition of women's knowledge about local plants (Section 6.2.3.1).

These outcomes demonstrate that positive collaboration between the formal school system (students and teachers), local knowledge holders (women and community leaders with knowledge of wild plants), and TMK practitioners (local healers) could be forged through contests. The most compelling form of collaboration achieved through these contests was between children (younger generation) and women with their elders/local healers in order to derive information on local plants. Linking environmental education and TEK, or fusion of multiple forms of knowledge, has been considered as an important ingredient of successful CBC initiatives (Goldman, 2003; Kellert et al., 2000; Seixas & Berkes, 2004) and the results show that contests can effectively provide the platform for establishing and strengthening links between various types of knowledge, particularly TMK.

Prizes or awards served as useful incentives for participation and they generated opportunities for collaborative engagement among participants and other village stakeholders such as local Forest Department staff, school teachers, administrators, and community leaders for the conservation of local plants. Most of the positive outcomes concerning participation, as perceived by the participants of biodiversity contests and recipe contests, provided evidence of collaborative efforts. RCMPCC in Amboli, the

Forest Protection Committee in Baripada, and schools that participated in the contests generated some motivation to continue experimenting with these approaches.

Increased involvement of women healers in village development activities, inclusion of recipe contests as an annual activity by Janseva Foundation (in Baripada), public recognition of women healers by Forest Department officials, and selection of recipe contest winners as leaders of self-help groups (Amboli) were some of the concrete actions resulting from the recipe contests. Inclusion of medicinal plants and local healers in developing school gardens (Amboli and Baripada) and joint exploration for developing a conservation plan of selected village medicinal plants were concrete steps taken as a follow-up of the biodiversity contests. In addition, the primary schools of Amboli and Baripada implemented simpler forms of biodiversity contests, deriving inspiration from the success of the contests in secondary schools. These examples of concrete action as inspired by the contests are 'observable consequences' which constitute the 'active' feature of community-based environmental education (EPA, 2000). Such institutionalization of contests by RCMPCC and Baripada Forest Protection Committee should be considered a highly sought after outcome of community-based environmental education, which has been a major lacuna of several such environmental education approaches reported in earlier studies (Center for Educational Research and Innovations, 1991; Chawla, 2001; Chand & Shukla, 1998; Henley, 1996; Saveland, 1976; Starnes, 1999).

The participants of the biodiversity contests and recipe contests also envisioned an interesting array of follow-up activities (6.1.3.3 and 6.2.3.3) that could strengthen the CBC outcomes by generating positive action and change at the local level. Increasing the frequency of such contests or instituting similar contests for existing village/school structures (home herbal gardens, school gardens and village gardens) or groups (teachers and healers) are some of the follow-up activities that could be easily implemented by the villages. These contests could also generate interesting pedagogical enrichment opportunities for local schools such as linking the main outcomes of contests with curricula by teachers, inviting local healers as guest speakers into classrooms and

preparing and using local language booklets documenting local plant uses and recipes. Finally, these contests provided a platform for meaningful partnership between local healers, community leaders, children, and women with schools. These partnerships, if fostered, could strengthen opportunities of exchange between local knowledge of village communities with formal environmental education in schools, and generate a positive learning platform for CBC.

Recipe contests, in particular, highlighted some features of effective adult environmental education (Clover & Tan, 2004) such as: a) increased participation of women in village level conservation and development activities; b) recognition of the local knowledge or TMK held by women; c) better cooperation among TMK holders (women), community leaders and school teachers; and d) creating the possibility of a new network of women healers in and around villages. These features of adult environmental education represent ‘women empowerment’ – a human well-being goal of CBC.

The contests also helped strengthen the process of intergenerational knowledge transmission through: a) creating a platform for dialogue between older healers and village children (as discussed earlier); and b) replicating and reinforcing some of the crucial skills to become TMK practitioners as identified in the previous chapter. The outcomes of biodiversity contests (Section 6.1.3.1) for instance, indicate that the five crucial skills most strongly referred to by the participants were: a) interest in local plants; b) identification of plants; c) habitat of plants; d) harvesting of plants; and, e) the knowledge of rare plants.

The process of contest announcement (through grade-wise meetings, pamphlets and teachers’ instructions on how to participate), preparation (incentive to win, learning from local healers at homes and in forests) and actual participation (exchanging information with classmates) aroused students’ interest to learn more about the local plants. In most cases, information exchange focussed on learning about the names, location and medicinal uses of local plants, which are important ingredients of the crucial skills of identification and habitat. Special demonstrations and visits to the forest by village

healers were organized by the school teachers as part of preparation and this imparted hands-on experience in learning about plant identification and habitat. Interestingly, at Amboli, information about rare plants like *Ragatrohida* was exchanged among students and shared by village healers during the contests. The learning about other crucial skills could be enhanced through improvement (Table 6.2) and follow-up activities (Table 6.3) of biodiversity contests. For instance, demonstration of processing and application skills could be organized in biodiversity contests through more active involvement of village healers.

Recipe contests also demonstrated reinforcement of four crucial skills: a) interest in plants; b) habitat of the plants; c) harvesting of plants; and d) knowledge of rare plants. The collaborative learning among participants with other stakeholders as a part of the preparation and the process of announcement of the contest generated interest and enthusiasm among participants about local plants. Interest in local plants was further augmented through an incentive of recognition of TMK held by women, which conventionally had not happened before. As a part of preparation, most women participants consulted older women healers or male TMK practitioners from the village about the plants and their locations in order to prepare recipes. The knowledge of local plants and their habitat, the harvesting of the particular part of the plant in the correct proportion for medicinal purposes in preparing the recipes, was one of the essential requirements for participation in the contest. For instance, the knowledge regarding medicinal uses and the locations of *Kurdu* and *Mokha* plant participants was gained by Baripada participants during the recipe contest (Section 6.2.3.1). Some of them also came to know about the *Ragatrohida* plant, which has become rare in and around Baripada.

The recipe contest participants from Amboli and Baripada suggested some changes to improve the effectiveness of the contests in future. These changes included: a) the inclusion of knowledge of rare plants as special criteria of evaluation in future recipe contests (Table 6.5); b) placing more weight on criteria like medicinal and/or nutritional uses in evaluation of participants; c) frequent organization of contests to capture different species of plants in different climatic seasons; and d) organizing recipe contests in the

forest. These changes reflect the importance of learning identification, harvesting and habitat skills, as well as reiterate the importance of the forest as a site for learning TMK. Finally, participants also offered an idea of organizing co-curricular or extra-curricular follow-up activities (Section 6.2.3.3) such as demonstrations by local healers in classrooms or informal conversations with healers about recipes on specific religious festivals. These activities underpin the significance of learning methods of TMK for skills such as identification, harvesting and habitat of local plants.

The two most significant outcomes of the biodiversity and recipe contests are: a) the creation of the platforms where local and formal knowledge holders can mutually interact, learn and engage in improving CBC outcomes; and b) the encouragement to the process of intergenerational transmission of traditional medicinal plant knowledge. CBC initiatives can draw on these outcomes to enhance achievement of local conservation and human well-being goals.

Chapter 7:

Conclusion



7.0 : CONCLUSIONS

7.1: Revisiting the objectives

This research undertook the challenge of understanding the intricate relationships among community-based conservation, traditional ecological knowledge, and environmental education. The main goal was to contribute to knowledge of and literature about conservation and development. A related goal was to help community leaders like Chaitram, referred to at the outset, with designing and implementing community-based conservation that embraces local knowledge and education. Towards this end, the field research examined two successful community-based conservation initiatives in Amboli and Baripada villages in India. The first research objective of understanding community-based conservation was largely a response to the need to generate learning through understanding the enabling conditions that make community-based conservation initiatives successful, as voiced by various scholars (Berkes, 2003; Keen & Mahanty, 2006) and international agencies (UNDP, 2004). Specifically, the research considered what lessons these two community-based conservation initiatives might have in relation to self-organization and cross-scale linkages, criteria developed by scholars through applying complex systems thinking (Gunderson & Holling 2002; Levin 1998).

As informed by the literature (Berkes, 2004; Goodman, 2003; Kothari et al., 2000) and revealed from the self-organization and cross-scale linkages of the two community-based conservation initiatives (Chapter 4), the role of local knowledge (in this case, traditional medicinal plant knowledge and its practitioners) is critical to successful community-based conservation outcomes. The transmission of traditional ecological knowledge is necessary to ensure that social learning occurs. However, empirical studies that support such an assertion are very few. Hence, the transmission processes (sources, methods and skills) and influencing factors of traditional medicinal plant knowledge (as an example of traditional ecological knowledge) were examined among healers in the two study communities. Finally, recognizing the potential of environmental education for enhancing community-based conservation outcomes through improved transmission of traditional

medicine knowledge has emerged from the analysis (Chapter 5), and is evident in the community-based conservation literature (Hackel, 1999; Kellert et al., 2000; Pathak et al., 2005), two locally-designed environmental education interventions were implemented.

The specific objectives of the research were:

1. To investigate and explain the role of self organization and cross-scale linkages in community-based conservation initiatives;
2. To describe learning from local knowledge systems by examining the role and transmission of traditional medicinal plant knowledge in community-based conservation;
3. To assess the role of environmental education approaches in the generation and transmission of local knowledge for community-based conservation

7.2: Reflections on research findings and conclusions

The main research findings, lead to the following conclusions in the areas of community-based conservation, transmission of traditional medicinal plant knowledge and community-based environmental education.

Key conclusion 1: The strategies of self-organization and cross-scale linkages as well as the outcomes of successful community-based conservation initiatives can be varied according to their local contexts. However, successful community-based conservation initiatives can still share some common features including achievement of human well-being and conservation of local biodiversity.

The community-based conservation initiatives of Amboli and Baripada exhibited different strategies of self-organization (use of different sources and triggers, funds and human resources, multiple sources and types of knowledge). They also established linkages with other actors (individuals and institutions), either horizontally (stronger in Baripada) or vertically (more evident in Amboli) or both, to accomplish different objectives. The perceived outcomes of both community-based conservation initiatives were different (e.g. revitalization of local medicinal plant knowledge in Amboli versus

improvement in agricultural production in Baripada), when viewed from the local communities' perspective. These findings are broadly consistent with the patterns of self-organization and cross-scale linkages in successful community-based conservation initiatives reported in other studies (Berkes & Seixas, 2004; Seixas et al., 2006).

One practical lesson is that the local context shaped by social, political, economic, and ecological factors contributes to different strategies for self-organization, cross-scale linkages and outcomes. Therefore, there may be little transferability of the lessons from one case to another. However, there are some common ingredients or dimensions on which future success might be predicated. Some of these common successful self-organization strategies and cross-scale linkage strategies are: shared vision, ability to use various human resources including local knowledge and its holders, adaptive learning, leadership, and building and sustaining partnerships with key stakeholders. These strategies or features can also provide the core contextual conditions or yardsticks for measuring the degree of success of community-based conservation initiatives. They should be taken into account while designing or evaluating community-based conservation initiatives.

Key Conclusion 2: The use and contributions of local knowledge and its practitioners in both self-inspired and externally-motivated community-based conservation initiatives are common and of critical importance.

The community-based conservation initiatives of Amboli and Baripada, even though they emerged and are in different social-ecological and economical contexts, have demonstrated the importance of incorporating local knowledge for success. The integration of local knowledge was evident at various stages of the initiatives. The local communities including community elders and healers were involved from the beginning of the initiative. Secondly, stronger partnership with local knowledge holders were built And sustained through ensuring their active participation in village biologist and plant diversity register activities. Finally, local-knowledge and practitioners were used in designing and evaluating both community-based conservation outcomes, namely: a)

biodiversity conservation (e.g. collaborative arrangements with local healers, university and college teachers and NGOs in assessment, monitoring and regeneration of local plants), and b) human well-being (e.g. empowerment of local healers and women). Central to the common strategies are the contributions of local knowledge and its practitioners, a condition which is desired in and demonstrated by successful community-based conservation initiatives (Berkes, 2004; Brown, 2003; Goldman, 2003; Kellert et al. 2001).

The use and recognition of local knowledge and its holders can lead to 'empowerment' and thereby create a possibility of 'knowledge in action' (Blaike et al., 1997) – the most sought after outcome of successful community-based conservation initiatives. Such deliberate efforts to integrate of local knowledge into community-based conservation initiatives also provide a ready platform for co-management possibilities (Kendrick, 2003).

With an explicit acknowledgement and deliberate focus on local knowledge such as traditional ecological knowledge or traditional medicinal plant knowledge, the scope of research examining 'scale' issues in community-based conservation initiatives can become much more fruitful, which is currently restricted to just spatial, temporal and jurisdictional scales (Cash, et al., 2006). Understanding the contributions and dimensions of local knowledge in promoting positive cross-scale linkages to enhance the outcomes of community-based conservation is an unexplored and promising area of future research.

Key conclusion 3: Transmission of traditional medicinal plant knowledge occurs through skill-specific processes that include ten crucial skill complexes, normally learned between the ages of 14 to 21 years from parents, other relatives and village healers.

To become a successful traditional medicinal plant knowledge practitioner or village healer the learning of ten crucial skills complexes was desired by healers from Amboli and Baripada. Five of these, interest towards plants, identification and harvesting of plants, processing, rare plants were known locally as foundational skills and were given

more importance than the other five skills (habitat of the plants, application of medicine, evaluation of treatment, consultation and follow-up with patients). Most of the skills were learned in a sequential manner (interest identification, habitat, harvesting, processing, application, evaluation, consultation and follow-up) and from family and other sources, which roughly corresponds to the earlier findings that indicate a transition of learners from simple to more complex and advanced tasks as established by the works of Ohmagari and Berkes (1997) and Ruddle and Chesterfield (1977).

The age group of 14-20 years is the preferred age at which transmission of crucial skills takes place. This group also corresponds to the age at which systematic learning of language takes place in the schools. While the interest towards plants might have developed in earlier years (e.g. at the age between 5-7 years as cited in the study by Chand & Shukla, 2003), this research established that the young prospective healers were chosen as the learners by older healers only after the age of 14, when their formal school-based training of language began. As well, in the rural Indian context, where access to and opportunities for secondary school education are limited to residential schools, the learning from vertical learning sources (family members or relatives) becomes more difficult. The schools in such cases can provide access to horizontal learning sources by linking with existing curricular or co-curricular activities.

The 14-20 age group presents challenges for the transmission of local knowledge generally and traditional medicinal plant knowledge specifically. By the age of 14 many young people in small rural villages have been directed into life choices. Some are compelled to stay in the village in order to support the basic needs of their families and others take up work. For such young people, sustaining interest in and motivation for learning about medicinal plants while working becomes an inevitable challenge. One of the ways to address this challenge as one healer from Amboli said is to, 'to catch them young', preferably before the age of 14 through conscious and deliberate efforts to generate interest in local plants. Such early exposure might motivate young people to explore being a healer as a profession.

Key conclusion 4: Different skill complexes are learned either at home or in the forest through a combination of six or more methods, depending on the nature of the skills to be learned and the gender of the learners.

The sources and methods for learning different skills varied according to the nature of skills and gender of the learners. The foundational skills were acquired mostly through vertical modes (learning from family members), whereas human skills were learned through more horizontal modes (other healers or *gurus*), particularly among male learners. Among female learners, vertical sources were used for learning both foundational and human skills, except that in-laws and husbands replaced parents and parental relatives. A wide variety of learning methods was used by learners according to the nature of skills and sex of the learners as reported in earlier studies (Ritchie & Ritchie, 1979; Ruddle, 2000). Whereas, more interactive methods were used for male learners for teaching hands-on skills (identification or habitat), certain skills were taught interactively (use of questioning) irrespective of the sex of the learners. These findings partly corroborate earlier findings (Chand & Shukla, 2003) in establishing that learning sources and methods used within traditional medicinal plant knowledge transmission are 'gendered' and systematic (not random).

Gender-based differences in sources and methods partly reflect the larger social context of how gender relationships are structured at the village level. Learning about these gender-specific preferences in traditional medicinal plant knowledge transmission would be useful while developing educational materials targeted to encourage traditional medicinal plant knowledge transmission among girls in/ through school. It is also useful to have home, school or village herbal gardens, which can be used as a potential teaching-learning site for traditional medicinal plant knowledge.

New knowledge and insights about the sources, skills and methods of learning were gained, especially in understanding of the transmission of local knowledge systems for the medicinal plants-- a natural resource which was underrepresented among other studies that primarily examined the transmission of local knowledge in the context of

subsistence resources in rural communities (Hewlett & Cavalli—Sforza, 1986; Ladio & Lozada, 2001; Ruddle, 1993; Ohmagari & Berkes, 1997). By targeting two generations, in understanding the transmission loss (See, Section 5.5, Chapter 5), this study has responded to a call for cohort-based analysis (Haarumaya, 2003b).

Key conclusion 5: The major factors that contribute to erosion of traditional medicinal plant knowledge are poor transmission (e.g. incomplete transmission, strict adherence to the rules by older healers), negative attitudes of local institutions (schools) and individuals (allopathic doctors, some community leaders), and the lesser degree of importance given to the foundational skills by the young healers.

Three factors have contributed most to the loss of traditional medicinal plant knowledge transmission: i) older healer's preference to teach only family members in Amboli; ii) stricter enforcement of criteria for choosing the learners discouraged many apprentices (young healers) to complete their training in Baripada; and iii) indifferent and in some cases negative attitudes of the formal education institutions (schools) in both villages. These factors were partly responsible for the decline of interest in acquiring the foundational skills of interest and identification by young healers. These skills, on the other hand, were considered most crucial and highly valued by the older healers. The poor transmission process in general and lower preference on certain foundational skills by young healers in particular contributed to loss of traditional medicinal plant knowledge. These findings join with those of Ohmagari and Berkes (1997) in explaining 'what' constitutes the transmission process-related reasons, which result in poor transmission or its erosion - a concern expressed but not clearly explored by studies on traditional medicinal plant knowledge healers (FRLHT, 2000; Kala, 2004; Shankar, 2004). A related concern expressed in this study was the negative attitude of allopathic doctors, school teachers, and administrators which is also cited as an important reason for the lack of motivation among healers and village children (prospective healers) to learn and exchange.

Interestingly, more than half of the healers from both sites acknowledged that having disciples with the ability to write and read could help them in learning skills like follow-up, which requires systematic record keeping of the patients. They definitely saw a link between literacy and being able to practise better – an issue that needs further examination. This finding is contrary to earlier study by Ohmagari and Berkes (1997), in which elders considered the negative role of formal education in reducing the attention span and patience among young learners. However in the present research, what was valued was literacy and not education. It should also be noted that the data did not reveal a relationship between literacy and transmission; rather the healers recognized that being literate would make a healer's job easier.

One of the ways to prevent the erosion of traditional medicinal plant knowledge is to enhance its intergenerational transmission by creating educational opportunities at the local (village) level. The village schools could play an important role in facilitating such learning by promoting the exchange of traditional medicinal plant knowledge and formal environmental education. This may help in two ways: a) The use and recognition of traditional medicinal plant knowledge by schools can establish the importance of local knowledge among students and local communities, who can become active partners in ensuring sustainable use of medicinal plants in and around village; and b) schools can generate and sustain the interest of students in acquiring traditional medicinal plant knowledge skills along with formal environmental education. This will indirectly boost the intergenerational transmission of traditional medicinal plant knowledge and help in changing the negative attitudes of villagers or modern medicine practitioners towards traditional medicinal plant knowledge. Such a vision for a school requires creating and experimenting with innovative school-based or village-based approaches that could facilitate exchange between traditional medicinal plant knowledge and formal environmental education.

Key conclusion 6: Biodiversity contests and recipe contests are useful environmental education tools for enhancing the community-based conservation outcomes.

Biodiversity and recipe contests may enhance community-based conservation outcomes in three main ways: i) they create platforms for collaborative learning opportunities which allowed recognition of local healers and women; ii) they establish who in the communities are local healers including the women; and, iii) they strengthen the traditional medicinal plant knowledge transmission processes by involving and interesting more people.

These contests served as platforms for collaborative learning, partnerships and action among traditional medicinal plant knowledge practitioners, school teachers, community leaders, administrators and between local healers, schools and the village (Section 6.1). Such partnerships are very useful in villages like Amboli in the transformation of adversarial relationships into positive relationships between school and village community. This yielded a village action plan for conservation of local medicinal plants through a workshop as an offshoot of the biodiversity contest (Section 6.1.3.1). A related advantage is development of biodiversity competence among school children through pedagogical enrichment activities in school (Section 6.1.3.3). These children could become important resources persons and potential partners in existing and future community-based conservation activities. Development of positive relationships between school and community and respecting local healers and school children as important custodians of conservation can help in arresting the traditional medicinal plant knowledge erosion processes at the local level.

The recipe contests of both villages also created a platform for mutual exchange of traditional medicinal plant knowledge and collaborative learning among village women, school girls, teachers, local healers and community leaders (Section 6.2.3.1 and 6.2.3.3). The use and recognition of local healers and women in these contests helped in enhancing their participation and recognition in village development and conservation activities. These outcomes are important well-being indicators (Kellert, et al., 2001; UNDP, 2004) particularly in the Indian context (Kothari et al., 2000), where the recognition of the role of women in community-based conservation is less visible and least-explored in past research.

Biodiversity and recipe contests helped strengthen the traditional medicinal plant knowledge transmission processes in the following four ways: i) the biodiversity contests encouraged school children and teachers to consult various traditional medicinal plant knowledge sources (village elders, traditional medicinal plant knowledge practitioners, family members and community leaders) within and around village; ii) the participants of these contests experienced the replication and reinforcement of most of the foundational traditional medicinal plant knowledge skills, which were considered crucial in transmission by traditional medicinal plant knowledge healers. For instance, most winners of both contests acknowledged that either they were engaged (see Sections 6.1.3.1 and 6.2.3.2) or could potentially be engaged (see Sections 6.1.3.2 and 6.2.3.3) in learning of traditional medicinal plant knowledge skills such as interest, identification, habitat, harvesting and knowledge of rare plants during the process (see Section ; iii) both contests provided the opportunity to use some of the traditional medicinal plant knowledge learning methods (demonstration of identification and use of plants by local healers) and the sites (community-conserved forest in Baripada and MPCA in Amboli, home and village herbal gardens); and iv) the focus on common and rare local plants with nutritional or medicinal value in recipe contests prompted young village women to learn identification, habitat and harvesting of these plants from older healers in and around villages.

Biodiversity and recipe contests are useful community-based environmental education approaches (as established in vision of inventive paradigm of EE, see Section 2.3.1) that enhance local knowledge such as traditional medicinal plant knowledge and promote its exchange with formal environmental education. The creation of collaborative learning and potential for pedagogical enrichment opportunities, achievement of human well-being outcomes such as empowerment of local healers and women, and strengthening of traditional medicinal plant knowledge transmission processes are concrete outcomes of using contests as environmental education tools which enhance community-based conservation initiatives. Additionally, both contests provided opportunities for villages to recognize the skills and knowledge present in their own community, and on which they can build capacity and partnerships to achieve self-empowerment and conservation of

local plants. Therefore, contests should also be perceived as useful EE tools as called for in the community-based conservation literature (Section 2.3). The contests thus provided scope or platforms for social learning (Schusler, Decker & Pfeffer, 2003) which is considered essential in collaborative natural resources management.

Various examples of follow-up activities envisioned by participants (Section 6.1.3.3 and 6.2.3.3) and action inspired by biodiversity contests (see Section 6.1.2) and recipe contests (see Section 6.2.2) are examples of 'pro-conservation behavior' among school students in the Indian context, as expressed in study by Bharucha (2005). Development of pro-conservation behaviour towards local plants is one of the desirable goals of effective environmental adult education (Clover & Tan, 2004) and learning for sustainability (Keen & Mahanty, 2006). By applying the principles of community-based environmental education (which originally evolved in the context of a developed country like USA) in a developing country like India, and especially among socially and economically disadvantaged communities and regions, this research expanded the scope and theoretical vision of community-based environmental education.

Key conclusion 7: The contests demonstrated a way to achieve fusion between traditional medicinal plant knowledge and formal environmental education through pedagogical enrichment activities. They also generated enthusiasm and strong interest within local communities as reflected in the level of participation and ready knowledge about the use of local plants.

The utility of methods like biodiversity and recipe contests in uncovering traditional medicinal plant knowledge in the two villages has far-reaching implications for NGOs or researchers engaged in participatory knowledge-based research with local communities. Close to sixty percent of the students enrolled in the school participated in the contests in both villages. The response of the local community in revealing traditional medicinal plant knowledge (as expressed by number of plants listed by school children in biodiversity contest or number of recipes made through local medicinal plants) was strong. These methods have shown great potential for use in participatory research and

community-based conservation approaches that are designed to focus on the local knowledge of communities.

The participants in biodiversity and recipe contests were enthusiastic about more frequent organization of the contests and inspired local NGOs and schools to initiate post-contest follow-up activities. Some of the follow-up activities stimulated by these contests (e.g. regular organization of recipe contest in Baripada and joint workshops for students, teachers and healers in Amboli), are good starting points to promote further experimentation regarding pedagogical improvement of environmental education practices. Some of these pedagogical enrichment opportunities (e.g. linking the outcomes of contests with curriculum or inviting local healers in the classrooms) were envisioned by the contests participants and school teachers. Such collaboration and exchange of traditional medicinal plant knowledge and formal environmental education could generate positive actions and viable alternatives for local conservation and sustainable use of medicinal plants.

Key conclusion 8: Broadly, this research has demonstrated that the transmission of local knowledge and promoting its sharing through relevant community-based environmental education approaches can improve community-based conservation.

The two community-based conservation initiatives examined in this research provided evidence of collaborative and adaptive learning, localness and informed actions for empowerment as components of local knowledge and environmental education. The research thus established new linkages between community-based conservation and community-based environmental education. There is strong evidence of recognition and use of local knowledge by local communities, along with formal knowledge systems as strongly exhibited by communities in both community-based conservation initiatives (Chapter 4). The role of local knowledge, however, has not been explicitly acknowledged in theoretical discussions of either community-based or socially critical environmental education. This research highlights these links and through an explicit recognition of traditional medicinal plant knowledge as a useful component of learning, strengthens the

theoretical vision of community-based or socially critical environmental education as a tool to improve community-based conservation.

The role of local knowledge experts (such as healers) has been adequately acknowledged by the contextual conditions of self organization (Section 4.1.4) and cross-scale linkages (local healers as important stakeholders in establishing horizontal linkages in Baripada and horizontal as well as vertical linkages in the case of RCMPCC). Further, even in the case of evaluation of outcomes, local communities of both initiative resorted to the 'knowledge in action' (Blaike, et al., 1997) - which is a product of fusion between local knowledge and scientific or formal knowledge (Brown, 2003). This research, demonstrated that traditional medicinal plant knowledge could create the 'discourse of hope' (Malone, 1996) among school grounds, community-conserved areas and community homes in realizing and enhancing the outcomes of community-based conservation.

7.3: Areas for further research

This study highlights the following areas for further research on community-based conservation, transmission and learning within local knowledge systems and environmental education as follows:

- i) The relationship between the use of local knowledge and self-organization strategies in successful community-based conservation initiatives;
- ii) The role of local knowledge in generating productive cross-scale linkages in community-based conservation initiatives;
- iii) The comparative contributions of horizontal and vertical linkages in self-inspired and externally-driven community-based conservation initiatives;
- iv) The effects of gender and the nature of traditional ecological knowledge skills acquisition on the selection of learning sources and methods in transmission of traditional ecological knowledge;
- v) The applicability of transformative and social learning to traditional medicinal plant knowledge transmission;

- vi) The interrelationship between the biodiversity competence (based on performance of in biodiversity contests) and academic performance of school children and its implications for curriculum reform;
- vii) The role of biodiversity and recipe contests as local environmental education tools in promoting community-based conservation outcomes from the perspective of NGOs and local communities;
- viii) Examination of the outcomes of biodiversity and recipe contests through theoretical construct of socially critical environmental education;
- ix) Action research with biodiversity and recipe contests winners on improving the local outcomes of community-based conservation.

7.4: Concluding comments

The research was constrained by practical and theoretical limitations. Theoretically, the research has not systematically examined the relationship between communities and schools through a political lens. Such an analysis would be emphasized by the 'development of the political literacy' (Fien, 1993) and goals of socially critical approaches to environmental education. The political dimensions were, however, indirectly approached through examining traditional medicinal plant knowledge as a subset of the local knowledge systems, with an enduring and underlying assumption that local knowledge systems have been subjugated and oppressed by dominant systems of formal education elsewhere (Semali & Kincheloe, 1999) and in India (Chand, 1996). This study assumes that by *explicit* (own emphasis) acknowledgement of local knowledge, one could depict the tensions and contestations of power, as meaningfully as one could gain through an implicit exploration of political dimensions. This assumption of the research may be critiqued by those theorists who often want to see discussion of power relations between and among various stakeholders.

The field research was restricted to small-scale community-based conservation initiatives, which were labeled as successful through international recognition. This automatically excludes community-based conservation initiatives in India which might be equally interesting and successful but failed to attract international attention. Under-

representation of some research participants, (e.g. non-participation of out of school children in biodiversity contests) was compelled by the design of the research and represents a limitation.

The interpretive and critical influence of this research, coupled with the commitment to examine local knowledge systems, poses a classical dilemma of representing realities by an 'outsider', as opposed to an 'insider'. The researcher, in this case, with best of intentions and using participatory research methods was, nonetheless, an 'outsider' in the closely-knit communities of Amboli and Baripada. The findings were largely based on information and data provided by insiders to an outsider. Further, I often had to balance between my two contesting roles of researcher and community representative. The views presented here, therefore, may have mixed flavors of the communities' own voices and my personal views.

Lastly, the research was considered as useful by some members of the communities. Various actions initiated in Amboli and Baripada village communities were the most practical and positive consequences of this research for local communities. This research has also partly addressed Chitarm's challenge by establishing that environmental education, local knowledge and platforms like biodiversity and recipe contests that combine both did and can become useful tools in promoting local conservation outcomes. Integrating contest-like approaches in existing community-based conservation initiatives might result in mutually reinforcing and beneficial interrelationships among community-based conservation, local knowledge systems such as traditional ecological knowledge and environmental education.

Chapter 8: References



8.0: REFERENCES

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Appendix A

Schedule of field activities carried out: November 2003 to February 2005

TIME	FIELD ACTIVITY
November 2003	• Arrived in Ahmedabad, Gujarat, met SRISTI staff and Prof Anil Gupta, shared research design and plan for field work. Three sites suggested by Prof Gupta, Baripada site finalized as a second case, contacts for Baripada obtained. Inputs on research questions related to TEK gathered from SRISTI staff. Review of literature in SRISTI library. Meeting with Prof V.S. Chand at Indian Institute of Management with regard to application of methods such as biodiversity contests and recipe contests. • Secondary data on Baripada case gathered from key people in SRISTI. • Arrived in Pune. Organized conceptual workshop with RCMPCC staff. Outline for fieldwork discussed and three potential field sites finalized. • List of key people generated in consultations with RCMPCC project leaders and staff for understanding the processes of self-organization and cross-scale linkage by RCMPCC. Initial contacts with potential interviewees made. • Met Dr Ashish Kothari of Kalpavriksha and collected literature related to policies such as National Biodiversity Strategy and Action Plan (NBSAP) of India, Community-based conservation in South East Asia etc. • Began understanding issues on and framing ideas on organizing policy workshops in the two field sites, to be finalized.
December 2003	• Met Dr E. Bharucha from Bharati Vidyapeeth, Pune, to understand their work on review of existing school-based environmental education programs and policies in Maharashtra. • Participated in the Barefoot Botanist workshop organized by RCMPCC and FRLHT at Amboli, which was also one of the three short-listed sites. Conducted interviews with Utkarsh Ghate, who was key person from FRLHT and major role player in sending nomination of RCMPCC for Equator initiative award. Met some of the field consultants who have been working with RCMPCC and gathered relevant data on self-organization aspect of RCMPCC. Also met villagers and members of the self help groups and local management committee) and community leaders from Amboli.

	• Pilot-tested interview checklist with 4 respondents (community members from Amboli village) and finalized one in consultation with RCMPCC consultants and project staff. • Completed two interviews with RCMPCC key people (audio recorded) on understanding self–organization and cross-scale linkages. • Visited other two potential sites of Kharpud, near Pune, and Leghapani of RCMPCC and met community members and RCMPCC project people from villages. Field visits (Medicinal Plant Conservation Areas) MPCAs and community meetings with the members of SHGs (Self-help group) /LMCs (local management committee) at both sites. • Visited Baripada (Second field site), its community-conserved forest, and meeting with community members. Also collected first-hand information about Baripada, its socio-economic, cultural, and ecological features. Visited office of Deputy Conservator of Forest, Dhule district and met Forest Department staff.
January 2004	• Chose Amboli and Baripada as field sites, based on predetermined criteria. Got some preliminary data on Amboli from RCMPCC • Reviewed field documents, reports, and other books available in RCMPCC office to deepen understanding on medicinal plant conservation and documented associated traditional knowledge in Maharashtra/India. • Met Dr Chitra Naik and two other agricultural experts from Indian Institute of Education, Pune. Got some literature from their library on educational issues among tribal children of Maharashtra. • Conducted in-depth interviews with senior advisor, project coordinator, Assistant project coordinator, Field botanist, and community organizer from RCMPCC, Pune on the self-organization and cross-scale linkages aspects of RCMPCC. • Participated in a review workshop of RCMPCC staff and collected update on RCMPCC's work in terms of biodiversity conservation. • Finalized interview schedules for LMC/SHG members and translated them into Marathi. • Draft pamphlets (in Marathi) for biodiversity and recipe contests were made. • Consent forms for local healers, school teachers/administrators, SHG/LMC /community members finalized, translated and photocopied in required numbers for use in Amboli.

	Selected a male and a female from Amboli through interviews and a short work assignment to assist in research in local language and data collection.
February 2004	- Arrived in Amboli for longer spell of fieldwork. Organized Inception workshops at Amboli with SHG/LMC members, forest staff, and small focus groups with schoolteachers from primary and secondary schools in Am. Dates for organizing biodiversity and recipe contests were finalized. - Distributed pamphlets of biodiversity and recipe contests in schools and among village community members in and around Amboli. - Conducted orientation sessions for school teachers/LMC/SHG members to evaluate performance of participants in biodiversity and recipe contests and ranking procedures. - Organized a recipe contest at Forest demo garden and Biodiversity contests at primary and secondary schools in Amboli. Collected entries from women and teachers about local medicinal plants. Evaluated entries in order to derive names local healers that children/women had cited as sources of knowledge. List of nine potential healers for a follow-up interview was generated. - Scouted 11 healers through recipe/biodiversity contests and conducted informal interviews with them. This was followed up by a day-long field visit in nearby forest areas with three to four selected healers. Understood their practices in the field with regard to identification, use, processing, and extraction of medicinal plants in order to understand the important skill. Generated a list of skills used by them. - Identified nine women healers from Amboli, and conducted a semi-structured interview with them with regard to methods of learning, sources of knowledge, mode of transmission and ascertained their views on incorporating this knowledge into education/development planning at school levels.
February 2004	- Visited FRLHT, Bangalore. Conducted interviews with Dr Darshan Shankar and Dr Utkarsh Ghate on their views in RCMPCC's case and use of local and Ayurvedic knowledge in medicinal plants sectors and policy issues. Also reviewed FRLHT library resources on medicinal plants. - Participated in a National workshop on Building a National Strategy for Development of Medicinal Plant Sectors in India co-organized by FRLHT and Ministry of Environment and Forest, Bangalore, India.

	• Returned to Amboli. Generated a list of questions to be asked to teachers and pilot-tested the questions with three teachers from Amboli. Most of the secondary school teachers have sent in written responses after semi-structured interviews.
March 2004	• Conducted interviews with the members of SHG/LMC members and organized focus group discussion with the boys and girls who have demonstrated high performance in the biodiversity and recipe contests. • Organized a follow-up focus group, separately with primary school and high school teachers about their feedback on the contests and clarifications on the issues/concerns on the questions for written responses. • Organized research review meeting with members of LMC/SHG and generated a list of issues to be taken up in a policy workshop. • Organized local healers/school children/community members in a two-day policy workshop. Field trip to the nearby forest area also conducted with selected local healers, teachers, and children to understand process of intergenerational exchange of knowledge. • Finalized activity reports on biodiversity contests, recipe contests, local healers' workshops, and focus groups with teachers. • Keyed in data on biodiversity and recipe contests on their performance in the contests. • Reviewed and organized data collected, compared the data with original objectives for data gaps and trained field researchers about filling up the data gaps. Tabulated the skill sets, which are considered critical for local healers and strategies for crosschecking this data set with of potential village youths/ disciples of healers outlined. • Returned to RCMPCC, Pune. De-briefed RCMPCC about field research activities. Plan for sharing/verification outlined. Additional help for translator was sought from Mumbai to speed up analysis before verification. • Returned to Winnipeg. • Sent a paper abstract to International Conference on Indigenous Knowledge to be organized at Penn State University, Pennsylvania.
April 2004	• Participated in the workshop on Equator Initiative. Brainstormed on the cross-scale and self-organizational issues of Equator Initiative cases. List of issues to be included in the technical report to UNDP generated in consultation with other EI

	team members and representatives from IISD, Winnipeg, and IDRC. • Discussed and learned strategies for qualitative analysis and coding of data with thesis advisors. • In consultation with RCMPCC cleaned the qualitative data on self-organization and cross-scale linkages. • Prepared a poster presentation for an abstract and a copy of poster titled 'Revisioning learning in traditional ecological knowledge: Opportunities for innovations in school reform' for International Conference on Indigenous Knowledge held at Penn State University, Pennsylvania, in May 2004.
May 2004	• Scheduled individual appointment with all members of thesis advisory committee and updated them on progress of the first phase of field research. Obtained suggestions on further analysis. • Participated in International Conference on Indigenous Knowledge held at Penn State University, USA. Prepared and presented a research paper 'Strengthening community-based conservation through traditional ecological knowledge: A proposal' based on the first round of field work. Also presented a poster on 'Community-based conservation'. • Prepared a workbook chapter 'Linking Conservation and Development through Gender Sensitive Methods: The case of medicinal plant conservation and women's local ecological knowledge 'based on field experiences for the workbook on Gender and Development. Draft sent to editor for comments. • Participated in a workshop on analysis of Equator Initiative cases with the students and faculty members at NRI's Center for Community-Based Resources management (CCBRM). Finalized the format and for the technical report to be submitted to UNDP. • Established contact with Janseva Foundation to initiate field research in Baripada. Reschedule of field activities due to the reasons of change in agricultural season due to late, heavy monsoon, and school vacations. • Article on Baripada sent to Honeybee newsletter at SRISTI, Ahmedabad, for publication.
June 2004	• Drafted a technical report and sent to thesis advisory committee members for comments. Draft also sent to RCMPCC for their comments/modifications. • Submitted an English draft (based on my preliminary analysis) to RCMPCC for

	local language version to be shared with the research participants at Amboli. • Finalized a paper for the proceedings of the International Conference for Indigenous Knowledge. • Presented a paper on gender sensitive methods in a workshop organized by CIDA and ESAC during the Canadian Congress at Natural Resources Institute, University of Manitoba. Finalized and published a chapter in a workbook later published by CIDA. • Formal annual review meeting with advisory committee members at University of Manitoba. Schedule for the visit of second field site and outline for sharing and verification. • Discussed with RCMPCC (phone and e-mails) about possible dates for organizing sharing/verification workshops at Pune and Amboli.
July 2004	• Finalized and submitted the EI technical report to UNDP and CBNRM at University of Manitoba. • Prepared a draft paper titled 'The Role of Traditional Ecological Knowledge in Education for Community-Based Resource Management' for presentation in International Conference on Common Property Resources, Mexico in August 2004. • Left for India, to organize a sharing/verification of Amboli field site and conduct fieldwork in Baripada. • Arrived in Ahmedabad. Obtained additional information on Baripada case from SRISTI staff. • Reached at RCMPCC, Pune. Organized a sharing workshop on RCMPCC related findings with staff. Plan for Amboli sharing workshop prepared.
August 2004	• Prepared draft reports in Marathi with the help of RCMPCC for sharing in Amboli. Also prepared activity-wise photo albums to hand over to relevant research participants in Amboli. • Shared booklets and main findings in three SHGs and LMC through small half-day workshops. Immediate reactions on the report recorded for further follow-up and revisions. • Sample verification of translated interviews/focus group and workshop reports performed in schools, with teachers and selected students. • Sharing cum verification workshop organized among five male healers and five

	recipe contest winners. Charts on skill sets finalized and additional data on local knowledge skills transmission related to medicinal plants obtained in small groups, separately for male and female healers. • Finalized paper for the Mexico conference.
September 2004	• Returned to Ahmedabad. Meeting with SRISTI staff and collected additional information about Baripada village. Plan for field research outlined and modified as suggested by informants. • Visit to Aurangabad. Met Dr Phatak of Janseva Foundation and conducted interview for understanding self-organization and cross-scale linkages of Baripada case. • Arrived in Baripada. Organized project inception workshop with villagers. Finalized schedule for the field activities. • Selected male and female research assistants and conducted a training session on organizing contests, interview techniques, and recording of data through observations. • Organized a recipe contest among women of Baripada in which more than 40 women participated who brought more than 90 recipes. A few outstanding women participants based on their performance in contest were identified for further follow-up and interview. • Conducted a forest walk with a selected youth and local healers for understanding the transmission process in identification and use of plants. Also collected ethnobotanical information on some plants in order to understand local usages of biodiversity. Also recorded insights on transmission of medicinal plants related knowledge through observation and informal discussions with local healers and village youths. • Made a visit to Bopkel village, where biodiversity contest was to be organized (as decided in the inception workshop). Met teachers, students, and organized orientation sessions with teachers and in each class (classes 5 to 9) with the students. • Organized a biodiversity contest in Bopkel residential higher secondary school, in which more than 12 teachers and 124 students from grades 5 to 9 participated. Participants were evaluated based on fixed criteria and recognized by the way of prizes in the form of teaching-learning materials.

	Conducted interviews with 2 school teachers and a principal and identified potential school children for a detailed interview for seeking their views on promoting exchange between local ecological knowledge and formal school-based environmental education.
September 2004	- Visited colleges of Pimpalner block (20 km from Baripada) and Sakri (40 km from Baripada) and gave a talk on community-based natural resources management to the bachelor degree students of life sciences. Also discussed a possibility of collaborative action research and training for Baripada village community to monitor the status of plant diversity in their community-conserved forests. - Organized a small meeting with members of Baripada village forest protection committee and sex to seven village youth interested in monitoring of their community-conserved forest. With the help of faculty members from colleges of Sakri and Pimpalner, organized a training-cum forest walk in Baripada.
October 2004	- Visited three home herbal gardens and a farm herbal garden (medicinal plants grown on the boundaries of agricultural farm) in Baripada and had informal interviews with local healers. Also, pilot-tested and adapted a semi-structured interview checklist for local healers. - Accomplished interview with school children winners of biodiversity contests. Carried out focus group separately with boys and girls on the issue of local ecological knowledge and ways of combining it with formal education in Bopkel village. - Completed interviews with 9 male healers (identified through snow balling) and 9 female-local knowledge experts (identified through recipe contest). - Prepared a skill charts for male and female healers and tried to understand the transmission of specific skills with selected disciples in Baripada village. - Met Dr P. Katariya, an Ayurvedic practitioner from the Nawapur town (approximately 60 km away from Baripada) and discussed issues related to exchange between local and Ayurvedic knowledge. Issues for the local healers workshop also short-listed. - Visited Range Forest Office at Pimpalner and met the Conservator of forest for Dhule forest division. Shared photographs from the field and updated Forest Department officials on the progress of field work in Baripada.

	- Organized local healers' workshop at Amboli. In this workshop formed a small focus group of mixed participants to elicit responses on the policy recommendations. - Met Agricultural Department Officer and Revenue Secretary (<i>talati</i>) to gather data on decadal change in agricultural development, monsoon and water table in Baripada.
November 2004	- Returned to Ahmedabad. Participated in the preparatory meeting for traditional food festival at SRISTI. - Drafted an article on Mr Raman Bhoje for <i>Loksarwani</i>- the Gujarat version of Honeybee newsletter. - Returned to Winnipeg - Workshop on EI cases at CBNRM, University of Manitoba for finalization and synthesis report on EI with NRI research team. Provided inputs and exchanged field experiences with NRI EI team and faculty members.
December 2004	- Reviewed my data, identified gaps, and discussed plan of next phase of fieldwork with my advisors at UM. - Consulted my advisor Dr John Sinclair on possible methods, tools, and strategies for analysis.
January 2005	- Submitted two paper abstracts for International Conference on Education for Sustainable Future to be organized at Ahmedabad. Made a special presentation on Community-based approaches to Education for Sustainable Development for presentation. - Prepared multimedia slide show CDs with all the photographs, slide effects and popular songs for wider distribution with schools and village communities at both the sites. - Tabulated information from Baripada field site for sharing/verification. - Arrived at Ahmedabad. Participated in the conference. Collected books, journal articles, and other publications (such as NBSAP) from the book fair at Ahmedabad workshop. - Visited RCMPPCC, Pune, and obtained additional information on Amboli. Distributed a set of two CDs to Amboli. - Meeting with Dr Bharucha at Bharati Vidaypith, Pune, to get update on their work on review of environmental education textbooks in Maharashtra.

	• Arrived in Baripada. Organized sample verification with five students, three local healers (male) and four female local healers.
February 2005	• Organized small group meeting, separately with village youth, female villagers and male villagers for sharing some preliminary results on intergenerational transmission, useful plants. Also shared copy of Honeybee and Loksarwani newsletters covering features on Baripada community-based conservation work and a story on local healer Mr Raman Bhoje. • Presented a slide show containing all the photographs capturing chronological field research activities in Baripada. Sought clarifications on some slides. Modified information based on inputs from local villagers. • Visited Bopkel village and shared CD and photographs with schoolteachers and a group of students. Installed CD in school computer. Collected additional feedback from the secondary school teachers on exchange of local knowledge and school based environmental education.

Appendix B

Checklist to study self-organization and cross-scale linkages in two CBC initiatives

The following is a list of questions and items that we should know about for each EI case. We are calling it a “checklist” because these are not the detailed research questions or objectives but items that you would want to make some notes about. They do not replace your objectives. Some may be very short; some may simply mean rechecking information that is already available. Some of the items are detailed aspects of the two main objectives (organization and cross-scale linkages) to make sure that we cover all the angles but not necessarily in detail. As we gain more experience with the cases, the list will evolve. We are hoping for feedback.

Contact information: Location, address, key persons

Community organization

- Origins of the project
- Date of community initiation
- Date of formally established (EI date)
- What inspired or precipitated the project? What were the sources of inspiration for the project?
- Whose idea was it? Locals, outsiders, gov’t, NGOs, etc
- Trigger event, if any.
- Catalytic element, if any
- Other?

Knowledge (note gender)

- Sources of knowledge: local/TEK and/or outside knowledge
- If there is local knowledge and if relevant, who holds this knowledge?
- If there is outside knowledge used in the project, was there capacity building (education, training, knowledge exchange)? Who was involved in providing capacity (e.g., other communities, NGOs, Gov’t, universities, researchers)?

Leadership and key people (note gender)

- Individuals: locals and/or outsiders (e.g., local leaders, researchers, entrepreneurs).
What role did they play? How did their role change during the course of the project?

- Key organizations: locals and/or outsiders (e.g., traditional authority, gov't, NGOs).
What role did they play? How did their role change during the course of the project?

Learning

- What learning processes did the project go through?
- Was there adaptive management (learning-by-doing)?
- Were there *learning networks* (self-organized groups consisting of people from different organizations, who are engaged in problem-solving, subsequently recycling their experience to tackle new problems)?

Funding

- If there was funding for initial community organization, who provided the funding?
- If there was capacity building, including training workshops, who funded it?
- If there was initial investments, who funded it?
- If there was funding for office, office personnel, vehicles, etc., who funded them?
- Human resources for initial organization (in-kind work as opposed to money)
- Volunteer support from pre-existing groups
- NGO and Gov't personnel providing their time or services for free
- Enlisting free help from outside groups, e.g., proposal writing, information, contacts, communication, etc.
- Were there pre-existing relationships between these groups and the community?
- Use of free facilities (e.g., community radio, office space, community television)

Cross-scale linkages

- Identification of main stakeholders (community groups, business groups, government, NGOs, development agencies) by levels of organization. Produce a table as way of checking off all the combinations, and enter the names of organizations/agencies into the matrix of the table. (local/community/village level, regional administrative level: municipality, district, etc. as appropriate, state/provincial level, national, including national NGOs international, including international development agencies)

Institutional linkages related to the project

- What were the key linkages?

- facilitating/enabling the project as barriers/hindrances to the project
- Whose initiative established these linkages?

Key horizontal institutional linkages (i.e., linkages across space and sectors, such as networking with other community groups, NGOs, development agencies, etc)

Key vertical institutional linkages (i.e., linkages across levels of organization, such as linking with key gov't agencies)

- How does the policy environment impact the project? (e.g., policies, legislation, political space for experimentation)
- What change (if any) did the project trigger in government legislation or policy?
- Are there any unusual interactions among gov't agencies, NGOs, development agencies, etc, that impact the project positively or negatively (e.g., competition over gov't department jurisdiction, or NGOs competing over funding)
- What motivates these linkages? What are the drivers of positive or negative interactions?
- Learning occurring in which processes and stages?

Biodiversity conservation and environmental improvements

- Conservation/improvement of what target resources (species and environmental resources)
- Changes in resource state
- Indicators of biodiversity conservation or improvement (e.g., birds or butterflies started to come back; water became clearer, etc)

Poverty alleviation

- Indicators of poverty alleviation (e.g., number of jobs, increased income etc)
- Improvements in community well-being (e.g., access to clean water, new village school, waste management etc.)

Appendix C

Checklist used to understand traditional medicinal plant knowledge (TMK) transmission from healers

- 1) From whom did you learn about medicinal herbs? And how did you learn? Describe your first experience?
- 2) Which skills are important to learn to become healers? Who taught you those skills? How?

Name of skill	Source	Methods	Specific rules

- 3) What other healers from your village or other village you know? How do you contact other physicians?
- 4) How do you maintain your patient's account?
- 5) Do healers provide medicine on a specific time?
- 6) Where do you give the medicine and how?
- 7) Is there any restriction that the medicine should be harvested on a specific time or place?
- 8) Who all come to learn from you? Why not many people come to you?
- 9) How do you teach other people?
- 10) Why do you select your son as your student?
- 11) What are your methods to teach your student?
- 12) What can we do to stop this knowledge from getting extinct?
- 13) What are the reasons for younger people not learning TMK?
- 14) What steps are important to prevent erosion of TMK?

Appendix D

Checklist used to conduct interview with Biodiversity contests and recipe contests

winners:

1. From who do you learned about medicinal plants? What all did you learn? How did you learn it?
2. When did you learn it for the first time?
3. Which things you like the most in the contest? Why?
4. Which subject do you like the most and why
5. Which herbs are getting extinct from the forest?
6. What can we do to prevent extinction of these herbs?
7. What do you want to be in future?
8. Which other contest can be organized in the school like the herbs contest?
9. Which thing you didn't like the most in the herbs contest?
10. What can you student do to make it better?
11. What should teachers do to make the contests better?
12. What should organizers do to make the contest better?
13. Did you see any change in school or fellow students or village after the contest?
Describe your observations.