



Indigenous Knowledge Definitions, Concepts and Applications

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"Understanding how people and societies acquire and use knowledge is essential for improving people's lives, especially the lives of the poorest"

The World Bank 1998

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Background

Human beings gather knowledge basically for two purposes: survival and development. We try to understand and come to grips with the environment in order to survive, and we try to find reasons for our survival that go beyond the intuitive reaction to physical threats. This is in short the basis for all kind of activities which aim at building up knowledge systems. Long before the development of modern science, which is quite young, indigenous people have developed their ways of knowing how to survive and also of ideas about meanings, purposes and values. They have taken care of the natural landscape for thousands of years. If we lose their wisdom, we lose the land as well. As long as native peoples are not heard, non-native audiences will continue to deal in caricatures. It has become customary to refer to this kind of knowledge as “*indigenous knowledge*” or “*traditional knowledge*”, “*local knowledge*”, “*traditional ecological knowledge*” “*ethno-ecology*” etc. and it is often seen as a contrast to, or at least as very different from, western ways of generating, recording and transmitting knowledge. For example, the elders (of Native Americans) say that if you don't take care of the plants, talk to them and relate to them, they get lonely and go away. To the sophisticated cynical modern mind that seems like a quaint belief yet there is no profound truth in it. Learning from *indigenous knowledge*, by investigating what local communities know and have, can improve understanding of agriculture, healthcare, food security education and natural-resource management issues. So In this report I tried to clarify what is the *indigenous* and the *indigenous knowledge* and what are the basic differences between this kind of knowledge and modern or western knowledge. The report also illustrates several issues related to “*indigenous knowledge*” as development and resources conservation with boxes describing several related definitions, examples of IK practices and key lessons.

Definitions

The term "*Indigenous*" defined according to UN as "Groups of people whose social, cultural and economic conditions distinguish them from other sections of the national communities, and whose status is regulated wholly or partially by their own customs or traditions or by special laws or regulations. People in independent countries who are regarded as *indigenous* are considered as descent people who inhabited geographical region to which belongs, at the time of colonization or the establishment of present state boundaries".

Considering the diversity of indigenous people, an official definition of "*indigenous*" has not been adopted by any UN-system body. Instead the system has developed a modern understanding of this term based on the following criteria:

- Historical continuity with pre-colonial and/or pre-settler societies.
- Strong link to territories and surrounding natural resources.
- Distinct social, economic or political systems.
- Distinct language, culture and beliefs.
- Form non-dominant group of society.
- Resolve to maintain and reproduce their ancestral environments and systems as distinctive people and communities.

The term "*indigenous*" has prevailed as a generic term for many years, in some countries, there may be preference for other terms including: tribes, first people/nations, aboriginals, ethnic groups, *adivasi*, *janajati*, geographical terms like hunter, nomads, peasants, hill people ... etc. In many cases, the term "*indigenous*" has negative connotations and some nations may choose not to reveal or define their origin as "*indigenous*".

Source: Alan, R. Emery and Associates (1997) Guidelines for Environmental Assessment and Traditional Knowledge. A report from the Centre for Traditional knowledge of the World Council of Indigenous People, Ottawa, Volume 23.

What is the Indigenous Knowledge?

Defining Indigenous Knowledge:

Indigenous knowledge (IK) is today a popular word through out the world. It has been interpreted in different ways at different places but generally it is understood as local or traditional knowledge that indigenous people have brought down with them from earlier times via the oral tradition. *Indigenous knowledge* (IK) is, broadly speaking, the knowledge used by local people to make a living in a particular environment (Warren 1991). Terms used in the field of sustainable development to designate this concept include indigenous technical knowledge, traditional environmental knowledge, rural knowledge, local knowledge and farmer's or pastoralist's knowledge.

Indigenous knowledge can be also defined as “A body of knowledge built up by a group of people through generations of living in close contact with nature” (Johnson 1992). Generally speaking, such knowledge evolves in the local environment, so that it is specifically adapted to the requirements of local people and conditions. It is also creative and experimental, constantly incorporating outside influences and inside innovations to meet new conditions. It is usually a mistake to think of *indigenous knowledge* as ‘old-fashioned,’ ‘backwards,’ ‘static’ or ‘unchanging’

A working definition of *indigenous knowledge* in the African context:

- Indigenous systems are localized African systems developed over long periods and whose patterns are based upon local knowledge systems and expressed in local languages.
- Indigenous systems would generally be viewed to be in balance with the local environment or would have sought such balance.
- The systems would have been influenced by innovations emerging from within themselves, from other indigenous systems and from national and international systems. Nonetheless, they are essentially African in origin even though they may display foreign attributes.

(Source: Matowanyika 1994)

Warren (1987) defined *indigenous knowledge* as a local knowledge that is unique to a given culture or society. According to Rajasekaran (1993), *indigenous knowledge* is the systematic body of knowledge acquired by local people through the accumulation of experiences, informal experiments and intimate understanding of the environment in a given culture. To Haverkort and de Zeeuw (1992), *indigenous knowledge* is the actual knowledge of a given population that reflects the experiences based on traditions and includes more recent experiences with modern technologies. It is also described as a non-conventional body of knowledge that deals with some aspects of the theory, but more of the beliefs, practices and technologies developed without direct inputs from the modern, formal, scientific establishment; in this case, towards the management of farms (Chambers *et al.* 1989, Gilbert *et al.* 1980).

Some of the characteristics compared to so-called western scientific knowledge were put up by Warren 1993. *Indigenous knowledge* is oral, usually not written. While western science tries to understand a whole from the pieces, *indigenous knowledge* sees things as wholes. Western science believes itself to be objective, while *indigenous knowledge* is deliberately subjective and sees human beings as part of the whole. Classification systems can be very different from western ways. One example is in the taxonomic classification of living organisms which is more based on ecological thought than genetic relatedness. We could go on with this list. Most western scientists reject *indigenous knowledge* as a methodical and non-scientific. It is true that western science is sometimes superior in its

ways of accumulating data and makes predictions. It is selective and very dependent on the way data are selected. Still, *indigenous knowledge*-systems are said to be “high context” systems which means that they are designed to incorporate very high level of contextual information specific of a given locale. *Indigenous knowledge* -systems can consequently be very different from each other and there is no single indigenous system: “each group has a system specific to their locale” (Warren 1993).

Common Sense as Link between Indigenous Knowledge and Global Science

The close attachment of *indigenous knowledge* to nature has enabled local cultures to survive for generations amidst pressures of change. The initiatives of the native peoples to respond to the present conditions of the environment provide the dynamic characteristics of the local cultures. The remarkable difference between local cultures and modern science is that the environment and nature shape the development of the former. In modern science, change occurs through human intervention and experimentation. Modern science produces man-made technologies that are largely dependent on human action while *indigenous knowledge* depends on the natural conditions of the environment. The common misconception about indigenous, local or traditional knowledge is that it is unscientific, backward and opposes change or development in the modern world. Unfortunately, human manipulation and exploitation destroyed the riches of creation. Thus, the riches of *indigenous knowledge* were also destroyed. Like modern science, *indigenous knowledge* observes a system that involves the theory and practice of learning. *Indigenous knowledge* begins with concept that develops into ideas, philosophies and principles that are evaluated and verified scientifically. The final form of *indigenous knowledge* is not simply a product a scientific investigation but a reality based on the actual experiences of the people. The link between *indigenous knowledge* and modern science is common sense. The *indigenous knowledge* learning system involves the brain and the senses. Learning begins with a concept that develops into an idea and philosophy based on affirmative and negative arguments. When the philosophy of a particular idea has been achieved, the result becomes a principle or theory. The theory or principle, however, remains a theory until it is verified by the human senses. Like modern science, the *indigenous knowledge* system strictly follows reason and logic. For example, an indigenous idea can never go ahead of a concept because without a concept, an idea will never exist. Moreover, the indigenous philosophy is developed through the argumentation of contrasting ideas. A philosophy can never exist as a single thought. The resolution of contrasting ideas finally becomes a principle or theory that serves as basis of field investigation or verification of a particular knowledge. Modern science cannot solely exist with complicated machines. Complicated machines are guided by the human conscience. Modern science cannot isolate itself from

the framework and structure of *indigenous knowledge* that includes concept, ideas, philosophies and principles that are similarly employed in scientific procedures. Moreover, the verification of practical realities through the senses of hearing, seeing, touching, smelling, tasting, feeling and moving are also inevitable to the global scientific understanding. Unlike *indigenous knowledge*, however, that can sustain itself with the inexpensive conditions of nature, the survival of modern science largely depend on highly complicated and expensive machines. In the absence of complicated machines, however, modern science can still survive, like the *indigenous knowledge*, on the basis of the human conscience. Thus, common sense evidently serves as the inevitable link between *indigenous knowledge* and the global science.

[Box 1]: LOCAL AND TRADITIONAL KNOWLEDGE

And other definitions that should be considered:

Local knowledge (LK) is a collection of facts and relates to the entire system of concepts, beliefs and perceptions that people hold about the world around them. This includes the way people observe and measure their surroundings, how they solve problems and validate new information. It includes the processes whereby knowledge is generated, stored, applied and transmitted to others.

Traditional knowledge (TK) implies that people living in rural areas are isolated from the rest of the world and that their knowledge systems are static and do not interact with other knowledge systems.

Traditional Ecological Knowledge (TEK) is indigenous or local knowledge and is the body of knowledge or natural history built up by a group of people through generations of living in close contact with nature, which through trial and error they have developed an understanding of the ecosystem in which they lived. TEK includes a system of classification, a set of empirical observations about the local ecology, and a system of self management that governs resource uses such as hunting, trapping and fishing. .

Ethno-ecology is the study of local or native people's interaction with the environment in which they live and work, including their perceptions, use and management, and knowledge. Sub-disciplines of ethnoecology include ethnobiology, ethnobotany, ethnozoology, and ethnopharmacology.

Sources: Warburton and Martin (1999)

Indigenous knowledge (IK), Traditional knowledge (TK) and Local knowledge (LK), generally refer to the matured long-standing traditions and practices of certain regional, indigenous, or local communities. Traditional knowledge also encompasses the wisdom, knowledge, and teachings of these communities. In many cases, this knowledge has been orally passed for generations from person to person. Some forms of traditional knowledge are expressed through stories, legends, folklore, rituals, songs, and even laws. Other forms of traditional knowledge are often expressed through different means. Such knowledge typically distinguishes one community from another. In a sense, it becomes their "identity". For many communities, traditional knowledge takes on a personal and spiritual meaning. Traditional knowledge can also reflect a community's interests. Some communities depend on their traditional knowledge for survival. Cosmological connections and differences in worldview distinguish "*Traditional Knowledge*" from "*Local Knowledge*". Social scientists often place knowledge within a naturalistic framework, and emphasize the gradation of recent knowledge into knowledge acquired over many generations. These accounts use terms like "*Adaptively Acquired Knowledge*", "*Socially Constructed Knowledge*," and other terms that emphasize the evolutionary and social aspects of knowledge. *Local Knowledge* and *Traditional Knowledge* may be thought of as distinguished by the length of time they have existed - decades to centuries versus millennia. A large number of scholarly studies in the naturalistic tradition demonstrate that *Traditional Knowledge* is not a natural category, and may reflect power struggles and relationships for land, resources and social control than adherence to a claimed ancestry or heritage.

[Box 2]: INDIGENOUS/ TRADITIONAL KNOWLEDGE CHARACTERISTICS

- It is dynamic, systematic and universal in principle. It is unwritten and known through the oral traditions.
- **It** is practical common sense, based on teachings and experience passed on from generation to generation.
- **It** is holistic - it cannot be compartmentalized and It is rooted in the spiritual health, culture and language of the people.
- **It** sets out the rules governing the use of resources - respect; an obligation to share. It is dynamic, cumulative and stable.
- **It** is a way of life - wisdom is using knowledge in good ways. It is using the heart and the head together. It comes from the spirit in order to survive.
- **It** gives credibility to people.
- It is based on experience, acquired from observations over time - it is argued that it may be most useful for local scale decision-making;
- It can show an understanding of the complex relationships between these individual components and the dynamic ecosystems within which they act;
- It is frequently linked with the sustainable use of local resources.
- It describes the health of the local environment, wildlife, etc., promotes consideration of the relationships between human and biological systems;
- It often describes these symbiotic relationships and provides the basis for life-sustaining decisions about how to relate to the environment.

Significance of Indigenous/ Traditional knowledge

Indigenous/Traditional knowledge is simple and practical. It links the survival of every human being to the wholeness of nature and its elements that support life. It provides the concrete situations of communities in relation with the environment and provides practical solutions to the problems of the people. Indigenous/Traditional knowledge defines a worldview of people and provides direction for their survival socially, economically, politically and spiritually. It explains the evolution of cultural behaviors that resulted from the efforts of people to adjust to their environment. In cases where the people have failed to resolve particular problems, the same became an opportunity for them to gain deeper understanding of the human situations. The key significance of Indigenous/Traditional knowledge is the development of peoples' capability to understand the world in a very simple manner as understanding the human self. The fact that people has survived for generations since the beginning of time, is a simple reason why this kind of knowledge cannot be simply undermined. Indigenous/Traditional knowledge deals with simple but applied education, economics, politics, religion, sciences and technologies of indigenous societies. This knowledge is basic but provides a rich ground for the development of the modern society.

[Box 3]: INDIGENOUS/ TRADITIONAL KNOWLEDGE FIELDS

- Agriculture, knowledge related to crop selection, intercropping, planting times.
 - Animal's husbandry and ethnic veterinary medicine, knowledge of breeding strategies, livestock characteristics and requirements, plant uses to treat common illnesses.
 - Pastoral systems — herd movement; range evaluation and monitoring; animal breeding and production; traditional fodder and forage species and their specific uses; animal diseases and traditional ethno-veterinary medicine.
 - Use and management of nature resources , knowledge of soil fertility management, sustainable management of wild species.
 - Health care, knowledge of plant properties for medicinal purposes.
 - Community development, common or shared knowledge provides links between community members and generations; and
 - Poverty elevation, knowledge of survival strategies based on local resources.
 - Conservational approaches.
 - Water: traditional water-management and water conservation systems; traditional techniques for irrigation; and use of specific species for water conservation.
 - Soil: soil conservation practices; the use of specific species for soil conservation; and soil fertility enhancement practices.
 - Plants: as a source of wild food, building material, household tools, personal uses (dyes, perfumes, soaps), fuel wood and charcoal, medicinal purposes.
 - Wildlife: animal behavior, habitats, uses.
- Worldview: views of the universe and humanity's place within it, relationship between humans and nature, myths, beliefs, customs.

(Source: adapted from Grenier, 1998; and Matowanujika, 1994)

Finally, the significance of Indigenous/Traditional knowledge is sustainability based on the holistic understanding of the relationship between human beings and nature. The concept of sustainability in this context offers solution to the environmental problems confronting the world today. Based on the framework and structure of the common sense which is the significant tool of the indigenous peoples towards survival, environmental conservation and sustainability does not need to be expensive. As a matter of fact, the recognition and support to local knowledge and cultures can make environmental conservation more meaningful, efficient and effective.

Why is Indigenous Knowledge Important?

There are two basic reasons why indigenous knowledge is important, first and foremost, the contribution of indigenous knowledge to local empowerment and development, increase the self-sufficiency and strength self-determination (Ulluwishewa 1993). Utilizing IK in research and management plans gives it legitimacy and credibility in the eyes of both local people and outside scientists, increasing cultural pride and thus motivation to solve local problems with local ingenuity and resources. Second, indigenous people can provide valuable input about the local environment and how to effectively manage its natural resources. Outside interest in indigenous knowledge systems has been fueled by the recent worldwide ecological crisis and the realization that its causes lie partly in the overexploitation of natural resources based on inappropriate attitudes and technologies. Scientists now recognize that indigenous people have managed the environments in which they have lived for generations, often without significantly damaging local ecologies (Matowanyika 1994). Many feel that indigenous knowledge can thus provide a powerful basis from which alternative ways of managing resources can be developed. Indigenous knowledge systems and technologies are found to be socially desirable, economically affordable, and sustainable and involve minimum risk to rural farmers and producers, and above all, they are widely believed to conserve resources. There are situations in which modern science is not appropriate, and use of simpler technologies and procedures are required. So learning from indigenous knowledge can improve understanding of local conditions and provide a productive context for activities designed to help the communities. In addition, the use of indigenous knowledge 'assures that the end user of specific agricultural development projects are involved in developing technologies appropriate to their needs' (Warren 1993).

In general indigenous knowledge represents a way of life that has evolved with the local environment, so it is specifically adapted to the requirements of local conditions as:

Restraint in resource exploitation: production is for subsistence needs only; what is needed for immediate survival is taken from the environment.

Diversified production systems: there is no overexploitation of a single resource; risk is often spread out by utilizing a number of subsistence strategies.

Respect for nature: a 'conservation ethic' often exists. The land is considered sacred, humans are dependent on nature for survival, all species are interconnected.

Flexible: IK is able to adapt to new conditions and incorporate outside knowledge.

Social responsibility: there are strong family and community ties, and with them feelings of obligation and responsibility to preserve the land for future generations. (Source: Murphree 1991).

Also, Indigenous knowledge has various essential applications which make IK more important as:

Natural Resources management

It is generally recognized that indigenous knowledge plays an important role in the sustainable management of natural resources and can also have an impact on issues of global concern. This recognition is directly related to the growing realization that scientific knowledge has contributed very little to the development of communities and societies; in fact it has commonly hastened the depletion of their social and natural resources. The industrial world is facing an ecological crisis.

[Box 4]: INDIGENOUS KNOWLEDGE IS IMPORTANT

- Indigenous knowledge provides problem-solving strategies for local communities, especially the poor. Indigenous knowledge represents an important component of global knowledge on development issues.
- Indigenous knowledge is an underutilized resource in the development process.
- Learning from indigenous knowledge can improve understanding of local conditions.
- Understanding indigenous knowledge can increase responsiveness to clients.
- Adapting international practices to local conditions can improve the impact and sustainability of our work.
- Investing in disseminating indigenous knowledge can help to reduce poverty.
- Sharing of Indigenous Knowledge within and across communities can enhance cross-cultural understanding

Yet few industrial economists would admit they could learn from indigenous people. Their economies are often called 'primitive', their technology dismissed as 'Stone Age', and most governments assume they can benefit only from salaried employment. Yet these traditional ways of life have proved highly durable. Hunting and fishing have allowed the Inuit to survive in the Arctic; nomadic pastoralism provides a livelihood for people in the arid Sahelian region of Africa; shifting cultivation has sustained hundreds of distinct cultures in the fragile ecosystem in the Amazon and the forests of South-east Asia. Non-indigenous people have not been able to survive in these extreme conditions without destroying the balance of the ecosystem. The key to this success is sustainability. Indigenous people today use the resources available without depleting them. They use their intimate knowledge of plants, soils, animals, climate, and seasons, not to exploit nature but to co-exist alongside it. This involves careful management, control of population, the use of small quantities but a wide diversity of plants and animals, small surpluses, and minimum wastage.

Sustainable Social Relationships

Social cohesion has been the key to survival for many indigenous cultures. Food gathering and hunting depend on mutual support and co-operation, and disharmony within a part of the group is dangerous to the whole. In many cultures men and women have developed complementary, if not equal, roles; political decisions are arrived at by consensus in many cultures, and other social arrangements that benefit the entire community have often been incorporated into indigenous cultural traditions. Marriage, for example, can also ensure political stability for the community (by regulating exchange between groups), and continuing harmony with the spirit world. For essentially religious reasons, marriage may be prohibited between a man and woman of the same kin group; in other societies it can only take place within the kin group.

Natural Remedies and Medicines

In many parts of the world, indigenous societies classify soils, climate, plant and animal species and recognise their special characteristics. Indigenous people have words for plants and insects that have not yet been identified by the world's botanists and entomologists. The Hanunoo people of the Philippines, for example, distinguish 1600 plant species in their forest, 400 more than scientists working in the same area. Of the estimated 250,000 to 500,000 plant species in the world, more than 85% are in environments that are the traditional homes of indigenous people. Nearly 75% of 121 plant-derived prescription drugs used worldwide were discovered following leads from indigenous medicine. Globally, indigenous peoples use 3000 different species of plant to control fertility alone. Some scientists now believe that indigenous knowledge may help them to discover important new cures for diseases such as AIDS and cancer.

IK and environment conservation

The cooperation between local knowledge and global science is necessary towards conservation and protection of the environment. To enable the local communities to actively participate into the assessment, evaluation and conservation of the environment, the acceptance of local knowledge in the modern world is necessary. Moreover, intervention and support towards the empowerment of local knowledge is also needed to enable the local people to assume their responsibility as custodian of creation. The link between local knowledge and global science is common sense. The common sense structure provides a simple but systematic process necessary for the assessment and evaluation of the existing condition of the environment. The cooperation between local people and modern scientists in solving the environmental and biological crises in the world is not impossible because common sense offers a venue of understanding between the simple and complex thinking of humanity.

IK in Development Projects

Development projects cannot offer sustainable solutions to local problems without using local knowledge (Warren, 1991). To ignore people's knowledge is almost to ensure failure in development. IK is considered the basis for self-sufficiency and self-determination because people are familiar with indigenous practices and technologies. They can understand, handle, and maintain them better than introduced western practices and technologies. Further still, IK draws on local resources. People are less dependent on outside supplies, which can be costly, scarce and available only irregularly. IK provides effective alternatives to western technologies. It gives local people and development workers extra options when designing development projects. Instead of searching only among western technologies for feasible solutions, they can choose from indigenous knowledge or combine indigenous and western technology. Indigenous technologies and practices are often cheaper than western ones. They rely on locally available skills and materials and often require little or no cash outlay. The use of IK is considered one of the cornerstones that can guarantee the survival of the economies of the developing world in the wake of scarce resources and reduced donor funding.

A Spiritual Relationship with the Land

For indigenous people, the land is the source of life - a gift from the creator that nourishes, supports and teaches. Although indigenous peoples vary widely in their customs, culture, and impact on the land, all consider the Earth like a parent and revere it accordingly. 'Mother Earth' is the centre of the universe, the core of their culture, the origin of their identity as a people. She connects them with their past (as the home of ancestors), with the present (as provider of their material needs), and with the future (as the legacy they hold in trust for their children and grandchildren). In this way, indigenesness carries with it a sense of belonging to a place. At the heart of

this deep bond is a perception, an awareness, that all of life - mountains, rivers, skies, animals, plants, insects, rocks, people - are inseparably interconnected. Material and spiritual worlds are woven together in one complex web, all living things imbued with a sacred meaning. This living sense of connectedness that grounds indigenous peoples in the soil has all but disappeared among city dwellers - the cause of much modern alienation and despair. The idea that the land can be owned, that it can belong to someone even when left unused, uncared for, or uninhabited, is foreign to indigenous peoples. In the so-called developed world, land is in the hands of private individuals, corporate investors, or the state and can be sold at the will of the owner. For indigenous peoples land is held collectively for the community (though competition between communities, and with outsiders, for rights of use, has sometime led to conflict). According to indigenous law, humankind can never be more than a trustee of the land, with a collective responsibility to preserve it.

Soil Science and agriculture

Local ecological knowledge are the key to understanding the sociocultural context of rural producers, thus representing a way to address problems that have plagued agricultural development programs for a long time. How, in the case of soil science and ethno-penology, could western and indigenous knowledge be linked to improve the success of cooperation in sustainable agricultural development? Soil maps are often not of interest to farmers who want to be able to grow multiple crops (Osunade 1992). The communication between farmers and scientists will be greatly improved if local soil nomenclature is used. The hope for sustainable agricultural development rests on the integration of all experiences rather than reliance on one tradition at the expense of the other.

[Note: For further applications of IK look at Box 5]

[BOX 5]: FURTHER APPLICATIONS OF IK

- Recognition that indigenous people who live in an area have understanding and insights about resources, environment and ecosystems has been extended to include a greater acceptance of a participatory approach to resource management - co-management has been an important development in resource management in some cases.
- Cultural preservation - knowledge and images of the past keep a culture alive and reinforce a sense of place and the notion of home.
- Land claim processes - indigenous geographies used as the basis for land selection and for developing approaches to native control.
- Resource management practices - involving a wide array of knowledge concerning species and species habitats.
- Land use regulation - TK used in locally-based planning processes to determine local and regional perspectives about who is most affected by developments.
- Environmental monitoring - to depict and record changes related to the well-being of a people over time.
- Conservation of plant diversity- against overexploitation; habitat loss and fragmentation; global climate change; species introductions & invasions.

Challenges to Indigenous Knowledge

IK is easily overlooked

Indigenous practices are sometimes not very spectacular. Despite their effectiveness, they can easily be overlooked. For example, a traditional irrigation system consisting of mud canals and bamboo pipes looks less impressive than an introduced system of earthen, straight, and cemented canals. Nevertheless the local system can effectively distribute water to the fields. In the long run, it might even conserve water better than cement canals. IK is often overlooked because it seems “messy” and is not obvious to outsiders.

IK is an endangered species

“When a knowledgeable person dies, a whole library disappears ”

This old English proverb is very true for indigenous knowledge since most of it is not documented and is passed on from one generation to another by word of mouth. Grenier (1998) observed that IK is stored in people’s memories and activities and is expressed in stories, songs, folklore, proverbs, dances, myths, cultural values, beliefs, rituals, community laws, local language and taxonomy, agricultural practices, equipment, materials, plant species, and animal breeds. IK is communicated orally, by specific example and through culture. Indigenous Knowledge systems around the world, especially in the developing countries of Africa, Asia and Latin America are at risk of becoming extinct. They are threatened by modernization, urbanization and globalization. Furthermore, little recording of IK is also leading to its extinction. IK is often transmitted by word of mouth rather than in written form. This makes it vulnerable to rapid change especially when people are displaced or killed in famine or war, or when younger generations acquire values and lifestyles different from their ancestors. Experience indicates that some IK is lost naturally as techniques and tools are modified or fall out of use. Development processes and populations changes like rural urban migration have further accelerated this loss, endangering the survival of IK. Younger generations are acquiring different values and lifestyles as a result of exposure to global and national influences, and traditional communication networks are breaking down, meaning that Elders are dying without passing their knowledge on to children. Furthermore, there are also local capacity limitations and the way global content is pushed. Even in the remote areas of the country, the powers that push global or just non-local content are much stronger than those pushing local content. This can be seen in television programming, in advertising, the spread of global brands, in classrooms using imported curricular and examinations, use of foreign languages in schools and universities and low status of local languages on the Internet, in research, in the dissemination of reliable scientific information and over reliance on foreign technical assistance.

IK is not well managed

The roles of creators and keepers of information tend to be quite distinct. The European Commission on Preservation and Access noted that those who created materials (IK) had no interest in their preservation, and those who kept materials had no control over their creation. Library and information professionals have not been at the forefront in terms of managing IK, despite the fact that it is becoming an important resource in planning and managing sustainable development projects. The dominant information management model has been based on acquiring, organizing and preserving recorded and codified knowledge, which is largely generated by researchers laboratories, research stations and universities. Such a model has little room for IK, which is not formally codified and resides wholly in minds of local people. Because IK is not well managed, it is very difficult to tap it for use in development projects. Underlying this is also the question of whether or not to use the western paradigm for preserving IK. Furthermore, the collection of indigenous information is laborious, time consuming and costly. For instance, as a result of inadequate management, most of the indigenous knowledge accumulated by colonial district officers and early missionaries cannot be located in many archival institutions.

Limited access to Indigenous Knowledge

Access to the indigenous information collected so far is very limited because it is not well organized in terms of being indexed and abstracted (UNESCO 1982). This partly explains the underutilization of IK in development projects. In addition, the lack of marketing strategies can also account for the low levels of use of IK (Dewalt 1994).

Unwillingness to share IK

It is common practice that some of the local people are not willing to share their IK. Some IK is generic and can be freely accessed in many communities, both by members and outsiders. Ordinary people are also generally happy to share their knowledge. However traditional healers and herbalists are not so willing to share their knowledge, and the ability to access supernatural sources of information to cure diseases as well as to solve social, political and economic problems.

IK may not always be accurate

Just like other knowledge systems, IK has its limitations and weaknesses. IK may not be appropriate and accurate in all circumstances. It may be unwise to accept all traditional knowledge as good practice or as sustainable practice. Indigenous peoples have at times mismanaged resources. For example, according to Kalland (2000), nomadic hunters and gatherers who are not tied to any specific resource base may not have a conservation ethic.

Blaikie *et al.* (1992) distinguishes five common trends and shocks in which the utility and maintenance of indigenous knowledge is extremely challenged:

1. Areas of very rapid population growth, or a concomitant reduction in resources caused by external pressures may require adaptations of new agricultural technologies to increase food production and diversify livelihoods. All these adaptations require the rapid learning of new skills. In this situation local knowledge would have to develop, and adapt very quickly, to respond to the new challenges. High population density and reduced field sizes often lead to a reduction in crop diversity in favour of main staple crops. High-yielding crop varieties have been promoted for decades in response to growing populations. No consideration has been given to the potential negative effects on agrobiodiversity and local knowledge.
2. Circumstances in which rapid immigration to a particular area has meant that the repertoires of knowledge for agricultural/pastoral production and environmental conservation, are out of focus with a new set of opportunities and constraints. The socio-economic structures, creating this knowledge, may also face fracturing and contradictory additions as new migrants arrive. Resettlement programmes provide one example of these circumstances. People find themselves in a new situation, where their local knowledge is no longer relevant. For instance, the crops brought with those resettling may not be adapted to the new environment, or new livestock diseases may threaten existing local veterinary practices. These types of shocks can lead to the complete loss of existing local knowledge.
3. Disasters and other extreme events cause a disjuncture, both materially and culturally. The knowledge system frequently suffers a shock. Such instances are both opportunistic as well as limiting. A relevant example in Africa is HIV-AIDS, where local knowledge may regain importance as a local-level strategy to combat food insecurity. Or its existence may be threatened because many people possessing the knowledge are lost to the disease.
4. There are other processes of slower moving environmental changes such as climate change, widespread deforestation or land degradation, that challenge the resilience and adaptability of local knowledge systems. For instance, criteria for crop variety or breed selection have to adapt to the changing environmental conditions. Then, an innovation and adaptation process must take place to adjust the system to arising challenges. Many examples exist of how farmers manage to adapt their practices and knowledge to changing environments, often the result is greater diversity.

5. Rapid commercialization and economic shocks may also undermine local knowledge. The marketing of local products in a global market will necessarily disconnect the product from its related knowledge context. The focus on commercial agricultural activities will replace local practices and threaten the local knowledge base. For example, in a Bamana village (Mali), local vegetable production was challenged by commercial gardening practices. This competition led to a reduction in local vegetables grown and the decreased involvement of women, who were previously responsible for this activity. With the decline in crop diversity, the importance of local knowledge has been reduced (Wooten, 2003).

[Box 6]: INDIGENOUS KNOWLEDGE CHALLENGES

- Lack of adequate documentation of local practices.
- Lack of documentation and promotion of adaptations and improvements in traditional systems which increase productivity and efficiency.
- Decreasing faith of many people in their own knowledge and practices in the face of aggressive promotion of modern methods by both commercial interests, as well as the government systems.
- Increasing competition from heavily subsidized external inputs.

(Resource: Emery 1996)

How to protect the Indigenous Knowledge

Raise Awareness

There is need to raise awareness in the community about the value of their IK. This can be done through recording and sharing IK success stories in songs, drawings, puppet plays, story telling, dramas, videos, and other traditional or modern means of communication. Village libraries can go along way in supporting this by initiating and organizing activities that will get the local people meet and share IK practices amongst themselves. Sensitization campaigns about IK and issues related to intellectual property rights should be conducted. All stakeholders including the local people, the IK practitioners, policy makers, librarians and documentarists should be involved. A free and conducive atmosphere should be created to ease sharing IK

Documentation

Libraries should record and document IK. Since IK is essential for development, it must be gathered, organized and disseminated in the same systematic way as western knowledge (Warren et al. 1993). Community members should be helped to record and document their IK generating what can be called Community IK databanks or libraries. It is important that local communities document their indigenous knowledge, give it due recognition and are empowered to maintain and use this knowledge. Community databanks or libraries will include local content, which is the expression of the locally owned and adapted knowledge of a community. This recorded IK can later be circulated in newsletters, books, video, radio, newspapers, telephones, Internet and other traditional or modern means of communication like art, drama and music. Indigenous forms of record keeping can be encouraged. It is also important that IK is made available. While doing this, accuracy of IK should first be ascertained by specialist to avoid use of IK practices which may be harmful to people. Related to this systems for storage and retrieval of indigenous knowledge should be developed.

Digital Libraries

While enhancing IK documentation, digital libraries based on IK can also be developed. These are known to preserve indigenous culture and making relevant information readily available locally. They open up the possibility of flexible and coherent multimedia collections that are fully searchable and browsable in multiple dimensions and permit more active participation by indigenous people in preserving and disseminating their own culture. Managing and preserving IK will help promote its utilization in development projects thus leading to reduce poverty, enhancing equity, reducing environmental degradation and thus leading to sustainable development and increased local participation in the development process. Information professionals should play a significant role in managing IK resources. Libraries should devise strategies for making IK information and knowledge accessible by:

- Preparing IK databanks (inventories and registers), taking into account the intellectual property implications of such databanks;
- Making IK accessible to the community by means of marketing strategies;
- Developing collection development policies for IK, bearing in mind the implications of the storage media for its preservation;
- Developing standardized tools for indexing and cataloguing IK systems;
- Compiling bibliographies of IK resources.

Identify the IK specialists

Further still, there is need to identify and indigenous specialists. Indigenous specialists are community members who have special skills or expertise in one or more subject areas or who practice a profession (e.g., healers). Other useful people to identify include decision makers, innovators, political opinion leaders, who in one way or the other affect management and application of indigenous knowledge in development projects. Databanks of such individuals should be maintained to allow for ease of access and sharing in case their IK is required.

Establishing the value of IK

In conjunctions with development workers, libraries should establish measures of assessing each type of IK _practice, technology, organizational structure, human resource, etc. The criteria to use may include the efficacy of IK, its cost-effectiveness, availability, understandability, cultural appropriateness, effect on different groups of communities, environmental soundness, and constraints plus whether and how they can be overcome. Such criteria would help establish the value of IK and the ease with which it can be applied in development projects. In order to enhance the economic value of IK, there is need to recognize the context in which IK was developed and where it is applied. Standards should be developed to accommodate the special nature of IK. Libraries and all concerned parties must also identify criteria and standards by which local people judge IK. Though this may be difficult, it is important to find out what people value most in a specific IK, why they chose it, what they see as its strengths and weaknesses, what they think would happen if the IK were not available, who would be most affected if the IK were not available and what features people look for when they test a technology. This implies that there is need to learn the people's view of IK. It is only if we combine both insiders' and outsiders' assessment, that we will be able to identify and better understand the value and usefulness of IK in development.

Capacity Building

The relevant capacity needs to be developed through training IK specialists, who will integrate IK in development projects, but are also knowledgeable in IK recording, storage, dissemination and matching IK to development projects. Librarians should be trained in local environments so that they get used to the needs of the local people and can actually appreciate the value of IK in those communities and how to manage with it. In conclusion, libraries should ensure that developing countries participate actively in our information society, rather than observing it from outside. All efforts should be made to ensure that IK is captured, documented, stored, made accessible and shared so that it can effectively applied in development projects. Libraries can go along way in ensuring that this is done.

[Box 7]: RESEARCHERS CAN ASSIST IN PRESERVING IK

Through the following:

- Record and use IK: document IK so that both the scientific and local community have access to it and can utilize it in the formulation of sustainable development plans.
- Raise awareness in the community about the value of IK: record and share IK success stories in songs, plays, story-telling, videos and other traditional or modern means of communication. Encourage people to take pride in their knowledge.
- Help communities record and document their local practices: Get local people involved in recording their IK by training them as researchers and providing means of documentation. (computers, video equipment, etc.)
- Make IK available: disseminate IK back to the community through newsletters, videos, books and other media.
- Observe intellectual property rights: have agreements so that IK is not misused and benefits return to the community from which it originates.

(Source: IIRR, 1996a)

What are the Methods for Recording Indigenous Knowledge?

There are a number of tools used by IK researchers to enable local people to share their knowledge in a meaningful manner. The following paragraph describes the tools that can be used by researchers to collect IK in the field.

Planning process should be identified before or during the recording of indigenous knowledge. The planning stages are:

- *Background research:* identify area/people to plan with, review of secondary sources of information.
- *Develop rapport* with local people: build a positive relationship based on trust.
- *Jointly identifying problems and opportunities*, and agreeing on what will be done.
- *Develop draft project proposal:* set goal, objectives, methodology.
- *Meet with local leaders and people* to fully disclose plans of proposed research and obtain permission to carry out the project. A village meeting is a good approach.

- *Reformulate proposal* based on feedback from community.
- *Select methods* and prepare for each thoroughly.
- *Field data collection and analysis* with these local people: it is suggested that local people be trained as facilitators to carry out the field research.
- *Jointly evaluating* and re-planning activities.

For more details related to general outline of activities, rules, and procedures to be followed when collecting, recording, and documenting IK, look at Box 8, and related to pastoral societies that should be taken un research work related to IK look to box 9. (Source: Warburton and Martin 1999)

[Box 8]: PROCEDURES NEED TO BE FOLLOWED WHEN COLLECTING, RECORDING, AND DOCUMENTING IK

Preparations

- *Define your study objectives.*
- *Determine content and extent of the study: What do you need to know? How much do you need to know? Do not attempt to collect more data than necessary!*
- *Select methods for recording and documentation. Methods should:*
- *Yield the required information.*
 - *Be low-cost.*
 - *Be easily understood by community members.*
 - *Be fun.*
 - *Place importance on local people rather than the researcher and other outsiders.*
- *Prepare for each method thoroughly before going to the community. If several people are involved, divide the work and agree on who will do what.*
- *Collect as much relevant information as you can about the community and related topics before you enter the community.*
- *Obtain permission from the community before you start the study or project.*

Entering the community

- *Introduce yourself and other outsiders to all community members involved.*
- *Explain to the community, in detail, the study or project objectives. Do not raise false expectations.*
- *Let people know that you have come to learn from them.*
- *Discuss with the community the possible benefits of the study.*
- *Inform community members of how much of their time the study will take.*
- *Learn the meaning of local terms (see Matching terms and concepts below).*
- *If possible, learn to speak the local language. This makes fieldwork much easier and is usually highly appreciated.*

Matching terms and concepts

Many misunderstandings and mistakes occur because outsiders and local people do not understand what each other mean when they use particular words. Your definitions and the way you classify things such as soils and diseases are not necessarily the same as those of community members. You may need to work together with local people to translate and match your terms and concepts.

In some cases, local definitions are broader than their western equivalent. It can be difficult to match indigenous terms and taxonomies with their corresponding western ones. Methods such as interviews, sorting, ranking, building taxonomies, and observation can help match indigenous and western terms.(Resource: Narayan 1996)

Tools of recording IK

In order to utilize IK, it must first be documented, and researchers must be aware of the ethical and methodological issues associated with doing research in local communities. The methods of participatory rural appraisal (PRA), for example, are now accepted as a means of effectively involving local people in the research process. Under this approach, PRA researchers assist local people to record their own knowledge, using techniques which involve a minimum of outsider involvement. Researchers must also be sensitive to the issue of intellectual property rights over knowledge. Local people have become concerned that knowledge is being "stolen" and used without their awareness and without a share in any economic benefits that may result from the development of related commercial products. Consideration must therefore be given to a plan for protecting the knowledge that results from research.

[Box 9]: SPECIFIC ASPECTS OF PASTORAL SOCIETIES WHICH NEED TO BE TAKEN ACCOUNT BY RESEARCHER

- Natural resources are highly variable in space and time (seasons, years).
- Main assets (livestock) are mobile rather than stationary.
- Land-use is extensive and without defined boundaries.
- Tenure tends toward common property regimes.
- Much simultaneous use of resources by pastoralists and other groups.
- Pastoralists must therefore negotiate with other groups to gain access to resources.
- Basic operational unit is household or informal group of households, to allow for flexibility and mobility. Arrangements for access to land are informal.

(Source: Waters-Bayer and Bayer)

There are three basic issues identified in this section that need to be considered when doing IK research. First, the participation of local people is crucial. Conventional research has tended to be controlled by outsiders with little involvement of local people in decision-making and little utilization of indigenous knowledge. An approach known as 'participatory research' (PR) is increasingly accepted as a way to address the problems associated with this 'top-down' development. PR seeks to involve local people in every step of the research process, with supporters claiming that this can have important benefits, including capacity-building and empowerment for local people, more appropriate project design and better use of IK. Participatory Rural Appraisal (PRA) represents a set of qualitative methods which are commonly used in participatory approaches to allow local people to document their knowledge with a minimum of outsider involvement. Indigenous knowledge recording including group of methodological tools for gathering information. Eight tools described in Box 10, are among the most commonly used for indigenous knowledge research, they represent only a portion of the tools available for fieldwork. The selected tool usually depends upon a number of factors, including, for example, objectives of the research, type of knowledge needed, appropriateness of technique to cultural setting, and relationship

between research team and community members. The main thing to keep in mind is flexibility: techniques can be altered, or new ones created to fit the requirements of a particular situation. Researchers should also note that careful sequencing of PRA tools is important to ensure good quality results.

[Box 10]: TOOLS OF RECORDING IK

TOOL no. 1 Interviewing

The word 'interview' implies an interaction between two or more people. Interviews vary in style and format:

- **Informal interviews** without structure or control. Interviewers record details of conversations or discussions they have in the community.
- **Unstructured interviews** based on a clear plan or a list of topics that the interviewer follows.
- **Semi-structured interviews** based on written lists of questions or topics that need to be covered in a particular order. These lists are called interview guides.
- **Structured interviews** based on a questionnaire or interview schedule which is closely followed during the interview. The course of the interview is mostly predetermined and little leeway is left for follow-up questions.
- **In-depth interviews** in which questions and topics are built upon the responses to previous questions. It is probing and flexible. The purpose is to uncover details about the 'who,' 'what,' 'where,' 'when,' 'how,' and 'why' of practices, technologies, beliefs, or tools. In-depth interviews help draw out the perceptions and experiences of individuals, expressed in their own words.

TOOL no. 2 Group discussions

Discussions with groups of six to 15 knowledgeable community members covering one or several topics. The purpose is to generate information, to build consensus, to validate information gathered by other means, or to clarify information in documents lacking detail. Group discussions can also help the facilitator learn local terms and concepts that might have no direct equivalent in the outsider's language. Group discussions foster participation and partnership in information gathering and analysis and generate information beyond what can be gleaned from interviews.

TOOL no. 3 Mapping

It is a method for collecting information on where certain resources or features are located. The purpose is to help identify and analyze the distribution of and the relationships between specific resources or features. The maps can show topography, soils, water, forest products, property regimes, land use (including where food is gathered), ecosystems, socio-economic data such as location of indigenous health practitioners, location of medicinal plants, common diseases, ritual sites, location of traditional birth attendants, and more.

TOOL no. 4 Historical comparison

Describes conditions, techniques, and practices in different time periods. The purpose is to determine changes. Can be useful if no baseline data are available. Historical comparison raises awareness of changes, helps reveal IK from previous times, helps explain changes in practices, and in the process, highlights advantages and disadvantages of specific practices.

TOOLS OF RECORDING IK: *Continued***TOOL no. 5 Matrix**

A method for listing items and recording their characteristics. Items such as livestock species or crop types are listed in rows and their characteristics, such as fodder requirements or yield and uses, are recorded in columns. The purpose is to help reveal the characteristics and qualities of listed items, and in the process, reveal the preferences of local people. This can enable communities and program managers to make informed decisions. Matrices help identify preferences, priorities, trends, or specific categories from the respondents' point of view. They can show the availability of resources, their advantages and disadvantages, and people's opinions regarding usefulness.

TOOL no. 6 Seasonal pattern chart

A pictorial representation of village life throughout the year. The purpose is to highlight the interrelationships of variables and the timing of activities. It can help a community identify annual events, or combinations of events, which pose challenges and those which hold opportunity. It allows a community to identify not only the interventions necessary to address problems, but also helps with scheduling—from planning and implementation to assessment. Preparation of a seasonal pattern chart can help discern the week- to-week, month-to-month, season-to-season activities of a community—its annual cycle—which in turn can reveal much about a people's perception of time. Important events can be recorded and lean and plentiful periods identified. The choice and description of discrete events (especially in the case of disease) draw out local perceptions of causation.

TOOL no. 7 Transect

It is a method of collecting information about major land-use zones within a community. Involves walking or driving along a carefully selected path that cuts across the main geographic features of a community or territory to compare main features, resources, uses, problems, and opportunities of different zones. The purpose is to provide a picture of how natural resources are managed and used by a community, and to help identify the problems and opportunities inherent to each zone. A transect walk is a useful tool for tapping local people's knowledge about land use, natural resources, soil types, problems, and possible solutions. It can yield a wealth of information on IK which might be overlooked by other data-gathering methods, especially if the informants classify and record the information.

TOOL no. 8 Institutional Mapping (Venn diagrams)

A participatory method that uses small circles of paper to identify community institutions (both traditional and external) and the nature of their relationships with each other. It is sometimes called 'chapati diagramming' because the circles of paper look like chapatis. The purpose is to identify and establish relationships between a community and its environment (both internal and external). These relationships are presented in such a way as to highlight the relative importance of particular relationships.

(Source: Grenier 1998)

Rights of Indigenous Knowledge and International Initiatives

The people in different societies perceive and interact with nature differently and have different traditions of the environmental knowledge. The perceptions and knowledge of such people are in part shaped by their values, world views, environmental ethics, and religion in a broader sense. The discussions on Traditional Knowledge, as a subject of Intellectual Property protection, continue to take the center stage at different spaces. It is particularly relevant for developing countries whose Traditional Knowledge mechanisms continue to be exploited without accruing any benefits. In other words, the increasing incidence of bio-piracy and bioprospecting has become a matter of immense concern to the legitimate custodians of Traditional Knowledge. The increasing importance of biodiversity, sparked by the emergence of new biotechnology, has generated a wide range of interest and competition over the genetic resources (GR). The pace of competition leads to the Western scientists and corporations turn to local communities for the genetic resources fuelling technical innovations in agriculture and health care. And the renewed interest in plant and animal genome has reignited tensions between local communities, national governments, and transnational corporations. These tensions are reflected in International Agreements governing control over the biodiversity and indigenous knowledge.

Since the establishment of what we now know as the intellectual property system? just over a century ago, indigenous knowledge, which is rich in medicine, art, crafts, music, literature, etc. has been steadily marginalized, simply because it has to do with the collective rights of a people and because it does not have a known author or creator. This legal vacuum could be looked upon as the continuation of an unending genocide inflicted on indigenous peoples from time immemorial. The Human Rights approach to traditional knowledge touts the primacy of 'human rights' obligations over other economic policies and agreements. But it is unclear what this 'primacy' means when it comes to using intellectual property mechanisms to protect traditional knowledge. The international human rights law has an ambivalent relationship with intellectual property law. The increasingly apparent intersection between human rights rhetoric, rules, and institutions and intellectual property has triggered various concerns. For starters, the two communities seem to speak 'very different languages': while intellectual property commentators tend to focus on the economic trade-offs between incentives and access, human rights commentators 'engage in a discourse of absolutes', emphasizing 'categorical rights and responsibilities. Another concern is that absence of a clearer understanding of human rights law's engagement with intellectual property issues.

Several International Conventions and Agreements address the subject of Traditional Knowledge, and the rights of indigenous and local communities

on their knowledge [ILCs], such as the Convention on Biological Diversity (CBD) and related protocols (Nagoya Protocol), the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGR), the U.N. Educational Scientific and Cultural Organization (UNESCO) Convention for the Safeguarding of Intangible Cultural Heritage, the World Intellectual Property Organization (WIPO), Permanent Forum on Indigenous Issues and Food and Agriculture Organization (FAO). Efforts in each of these venues are grounded in different theoretical approaches to the question of why Traditional Knowledge should be protected and they focus on a different set of concerns. The following describes the work and the activities of some organizations that concern of IPR on traditional knowledge:

Convention of Biological Diversity (CBD):

The CBD was adopted in response to the growing concern over the depletion of the world's biological diversity. The Preamble of the Convention on Biological Diversity (CBD), recognizes the "close and traditional dependence of indigenous and local communities ... on biological resources and the desirability of sharing in the benefits derived from the use of traditional knowledge, innovations and practices." National obligations toward indigenous and local communities occur in Articles 8 (In-situ Conservation), 10 (Sustainable Use of Components of Biodiversity), 17 (Exchange of Information), and 18 (Technical and Scientific Cooperation), (look at Box 11 for CBD articles related to indigenous knowledge and ILCs). Following the CBD, a number of developing countries enacted laws regulating access to genetic resources and associated Traditional Knowledge within national borders. But generally, the effect of these provisions does not extend beyond national borders. Moreover, where access regimes require the permission of multiple and hard to identify stakeholders, they may unintentionally lead to an 'anticommons' (Heller, 1998). There is a huge concern in developed countries and among multinationals that the CBD frames traditional knowledge and biological resources through the lens of state sovereignty, and vests ownership of these resources in the state, which might have drastically different priorities with respect to these resources than indigenous groups. Because the CBD recognizes state's sovereign rights over the genetic resources within their borders, and given the close relationship between genetic resources and traditional knowledge, do states have, in effect, control over Traditional Knowledge. Where true, that is problematic, as some of the worst examples of indigenous group marginalization have come at the hands of the national governments. And it raises the question of who, in practical terms, is the beneficiary of the CBD's preservation ethic-indigenous groups or the developing country government that may or may not advance their interest. The CBD works primarily through implementation of its principles and directives in national law, policy, research, and management. The meetings of the Conference of Parties (COP) result in decisions that provide instructions and guidance for parties on

implementing the convention in their national activities. Article 8(j) and related articles provide a basis for indigenous participation in all activities of the convention that touch on indigenous issues (UNEP 1998b). This includes participation in work plans for the various ecosystems, implementing the ecosystem approach, controlling alien species, carrying out impact assessment and monitoring, and building the Clearing-House Mechanism

[Box 11]: INDIGENOUS KNOWLEDGE AND ILCs ARTICLES IN CBD

Article 8 (j): Framework provision

"Each Contracting Party shall, as far as possible and as appropriate ...subject to its national legislation, respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity and promote their wider application with the approval and involvement of the holders of such knowledge, innovations and practices and encourage the equitable sharing of the benefits arising from the utilization of such knowledge, innovations and practices"

Article 10 (c): Customary use

"Each Contracting Party shall, as far as possible and as appropriate ... protect and encourage customary use of biological resources in accordance with traditional cultural practices that are compatible with conservation or sustainable use requirements"

Article 17. Exchange of Information

*"1. The Contracting Parties shall facilitate the exchange of information, from all publicly available sources, relevant to the conservation and sustainable use of biological diversity, taking into account the special needs of developing countries.
2. Such exchange of information shall include exchange of results of technical, scientific and socio-economic research, as well as information on training and surveying programmes, specialized knowledge, indigenous and traditional knowledge as such and in combination with the technologies referred to in Article 16, paragraph 1. It shall also, where feasible, include repatriation of information."*

Article 18 (4): Technology cooperation

"The contracting parties shall, in accordance to national legislations encourage and develop methods of cooperation for the development and use of technologies, including indigenous and traditional technologies. For this purpose, the contracting parties shall also promote cooperation in the training and exchange of experts"

(Source: CBD Convention 1992)

Nagoya Protocol (NP), Strategic Plan for Biodiversity 2011-2020 and related Aichi Targets:

NP is an international instrument aims to facilitate the implementation of the third objective of the CBD focused on Access and fair Sharing of Benefits coming from Genetic Resources and related traditional knowledge (ABS). NP was adopted in Japan in October 2010 by the Conference of Parties (COP 10). This protocol governs access to genetic resources and the fair and equitable sharing of benefits arising from their utilization. NP objectives, general contents and related articles are summarized in the Table 1. In Nagoya, Aichi Prefecture, Japan, adopted a revised and updated Strategic Plan for Biodiversity, including the Aichi Biodiversity Targets, for the 2011-2020 period. This Plan provides an overarching framework on biodiversity, not only for the biodiversity-related conventions, but for the entire United Nations system and all other partners engaged in biodiversity management and policy development. The Aichi Targets Policy and strategic goals explains how to achieve the CBD objectives and how the ILCs can contribute to achieve each of the Aichi targets. The most related Aichi target to ILCs is target 18 which states that "By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels"

[Box 12]: COP 13 and IK

The recent COP13 in Mexico 2016 highlights the following topics on traditional knowledge and indigenous peoples and local communities:

- The voluntary guidelines to recognize, safeguard and guarantee the rights of indigenous peoples and local communities over their traditional knowledge, innovations and practices. These guidelines would help Parties develop legislation preventing the unlawful use of traditional knowledge, and are meant to insure that private and public institutions obtain prior informed consent from communities when accessing traditional knowledge, and insure the fair and equitable sharing of the resulting benefits.
- The principles of the Rutzolijirisaxik Voluntary Guidelines for the Repatriation of Traditional Knowledge, currently under development. These guidelines aim to help facilitate the recovery of traditional knowledge by indigenous peoples and local communities.
- Tkarihwaié:ri Code of Ethical Conduct to Ensure Respect for the Cultural and Intellectual Heritage of Indigenous and Local Communities Relevant to the Conservation and Sustainable Use of Biological Diversity
- A revised glossary of relevant key terms and concepts to be used within the context of Article 8(j) and related provisions will assist international negotiators regarding appropriate terminology when working on these issues.

Table 1. Indigenous and Local Communities [ILCs] in the Nagoya Protocol

Obligations and Objectives	General Contents	Related NP Articles
1. Access to genetic resources	<ul style="list-style-type: none"> • Access is subject to PIC + MAT. • Regulates access to TK associated with GRs. • Special considerations in national ABS regimes. • The role of NP focal pints. • ABS CH mechanisms. 	Articles: 6- 7- 8- 13- 14- 18 (3)
2. Fair and Equitable Sharing of Benefits	<ul style="list-style-type: none"> • Forms of shared benefits. • National legislation and measures aiming to ensure that benefits are shared with the ILCs and based on MAT. 	Articles: 5- 9- 10- 19- 20- 23
3. Compliance	<ul style="list-style-type: none"> • Measures to insure that access to GRs + TK is based on PIC and MAT. • Measures to non-compliance with ABS legislations. • Monitor and enhance transparency surrounding the utilization of genetic resources. • Promote the enforcement of MAT between users and providers of GRs and/or TK. 	Articles: 15- 16- 17- 18
4. Traditional Knowledge	<ul style="list-style-type: none"> • Take into consideration the TK in their national legislations. • Mechanisms to inform potential users about their obligations. • Develop model contractual clauses to insure the ABS related to TK. 	Articles: 7- 16- 12

The World Intellectual Property Organization (WIPO):

The World Intellectual Property Organization (WIPO) Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore (the IGC), which met for the first time in 2001, is in discussions about draft provisions for the enhanced protection of traditional knowledge and traditional cultural expressions against misappropriation and misuse. WIPO's work in these areas involves close cooperation with other international organizations and NGOs, as well as the organization of a wide range of capacity building activities. Capacity-building resources include practical guidelines for indigenous and local communities on developing intellectual property protocols, and information technology tools for managing intellectual property issues when digitizing intangible cultural heritage. In 2000, the WIPO General Assembly established forum for the discussion of intellectual property issues in relation to access to genetic resources and benefit sharing, the protection of traditional knowledge and expressions of folklore. The work program has produced an impressive number of discussion papers, surveys of national laws and data obtained by means of surveys, consultations and fact-finding missions. The technical dimensions of the issues have received a thorough exploration in a number of papers prepared by the Secretariat. The work program also has produced a number of practical outcomes as: A toolkit for the management of intellectual property in the context of documenting traditional knowledge and genetic resources; a practical guide for the protection of traditional cultural expressions and a database of contractual provisions relating to intellectual property and access to genetic resources.

Discussions of WIPO to date have considered the following issues:

- Human rights treaties and other existing or emerging instruments that are applicable to traditional knowledge and genetic resources.
- Elements of customary law that are vested in traditional knowledge protection and transmission.
- Analysis of indigenous participation, including the levels and roles in decision-making, including measures to ensure compliance with free, prior and informed consent.
- Options and opportunities in the proposed certificate of origin, source or legal provenance from genetic resources.
- Role of customary law in the protection of traditional knowledge and development of regimes on access to genetic resources and benefit sharing.

In applying these principles at the domestic and national level, it is envisaged that an international access and benefit-sharing regime would be supported by national legislation that addresses a sui-generis protection of

indigenous traditional knowledge, innovation and practices, ensuring compliance.

Food and Agriculture Organization (FAO)

The FAO addresses traditional knowledge in the context of Farmers' Rights. According to its Article 43 9.2 (a), the protection of traditional knowledge relevant to plant genetic resources for food and agriculture is one possible measure to protect and promote Farmers' Rights. Because the responsibility to realize Farmers' Rights rests with national governments and is subject to national legislation, needs and priorities, the Contracting Parties of the FAO-IT enjoy great freedom when implementing the provisions of Article 9.2 (a) on the protection of traditional knowledge. National mechanisms realized for this protection may thus take the form of existing and sui generis forms of IPRs or any other legal form the Contracting Parties.

The International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA)

The FAO has produced a treaty in the form of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) (adopted by FAO Member countries in November 2001). The treaty recognizes the contribution of "local and indigenous communities and farmers of all regions in the world" to the conservation and development of plant genetic resources. The implementation of farmers' rights requires the "protection of traditional knowledge that is relevant to plant genetic resources for food and agriculture", as well as the rights of participation in the benefits and decision-making related to PGR (See Article 9.2). In essence, the treaty establishes a principle of farmers' rights and provides some guidance as to the areas in which contracting parties should act, but it does not provide detailed standards for these areas. It is not even clear if contracting parties are necessarily obliged to act in these areas since the provision simply says that contracting parties "should" act in this area rather than "shall". The provisions of the treaty are also circumscribed by the scope of the treaty. This treaty is aimed at preventing the loss of agro-biodiversity rather than biodiversity in general. One main difference between the idea behind the CBD and the ITPGRFA is that benefit sharing under the ITPGRFA is linked to a specifically defined trigger point for when benefit sharing shall take place. Consequently, benefit sharing is detached from the individual access situation and provider. Also ITPGRFA provides a standardized means by which countries can exercise their sovereign rights to a specific and limited selection of plant genetic resources for specific uses. It also implies a standardized approach to gaining prior informed consent and mutually agreed terms.

Permanent Forum on Indigenous Issues (Permanent Forum)

The Permanent Forum is an advisory body to the Economic and Social Council established by resolution 2000/22 on 28 July 2000. The Forum has the mandate to discuss indigenous issues related to economic and social development, culture, the environment, education, health and human rights. The Permanent Forum was the outcome of a resolution by the Commission of Human Rights in 2000 that was adopted by the Economic and Social Council. The Permanent Forum has a mandate to “discuss indigenous issues within the mandate of the Council relating to economic and social development, culture, the environment, education, health and human rights”. One of its specific tasks is “to promote the integration and coordination of activities relating to indigenous issues within the United Nations system”. Many indigenous representatives expressed grave concern over bio-piracy and genetic engineering, and called for the protection of genetic resources and a moratorium on bio-prospecting. The protection of traditional knowledge and indigenous intellectual property was a high priority for indigenous peoples and could be coupled with free, informed and prior consent. The objectives of Permanent Forum are:

1. Provide expert advice and recommendations on indigenous issues to the Council, as well as to programs, funds and agencies of the United Nations, through ECOSOC;
2. Raise awareness and promote the integration and coordination of activities related to indigenous issues within the UN system;
3. Prepare and disseminate information on indigenous issues The Permanent Forum holds annual two-week sessions.

The United Nations University (UNU) Centre on Traditional Knowledge

The UNU TKI aims to promote and strengthen research on traditional knowledge of indigenous and local communities conducted from a global perspective, grounded in local experience. In particular, the Institute seeks to contribute to:

- Change mindsets and paradigms about the role of traditional knowledge in our society and in key sectors such as academia, government and business.
- Increasing the recognition and importance of traditional knowledge.
- Developing the application of traditional knowledge in a broad range of contexts (e.g. ecosystem management and biotechnology).
- Developing strategies for the preservation and maintenance of traditional knowledge.

- Facilitating the development of the capacity of indigenous communities to conserve and apply their knowledge in an increasingly globalized economy.

The UNU TKI will investigate the threats to traditional knowledge, methods to maintain traditional knowledge, and the resilience of traditional knowledge systems. It will also consider the links between conventional and indigenous scientific systems while addressing some of the important questions this raises both in terms of research and capacity development, including:

- *f*Traditional knowledge and climate change
- *f*Traditional knowledge and water management
- *f*Traditional knowledge and biological resources
- *f*Traditional knowledge and marine management
- *f*Traditional knowledge and forestry
- *f*Traditional knowledge and international policy making.

The Traditional Knowledge Initiative, was established in 2007 with the generous support of the Christensen Fund, a leading US based foundation active in the areas of cultural and biological diversity. The pilot program is an important step in the process towards the establishment of a permanent UNU TKI.

Key pilot activities include:

- *f*Climate change and indigenous peoples
- *f*A book on the role of traditional knowledge
- *f*Water management and traditional knowledge
- *f*Traditional knowledge Bulletin
- *f*Pacific Islands programme.²⁴

Summary

The indigenous knowledge (IK) is the body of knowledge or natural history built up by a group of people through generations of living in close contact with nature. IK have developed and through trial and error an understanding of the ecosystem in which they lived. IK is important because it represents a way of life that has evolved with the local environment, so it is specifically adapted to the requirements of local conditions. With the rapid environmental, social, economic and political changes occurring in many areas inhabited by indigenous people comes the danger that the IK they possess will be overwhelmed and lost. Researchers can assist in preserving IK through the following: Rerecord and use IK, raise awareness in the community about the value of IK, help communities record and document their local practices and make IK available. Indigenous peoples should not

be treated as clients or mere stakeholders in the process, but should be invited to participate in all levels of decision making and management, finding representation on steering committees, planning boards, advisory bodies, and similar organizations. The cooperation between local knowledge and global science is necessary towards conservation and protection of the environment. To enable the local communities to actively participate into the assessment, evaluation and conservation of the environment, the acceptance of local knowledge in the modern world is necessary. Moreover, intervention and support towards the empowerment of local knowledge is also needed to enable the local people to assume their responsibility as custodian of creation. The link between local knowledge and global science is common sense. The common sense structure provides a simple but systematic process necessary for the assessment and evaluation of the existing condition of the environment. The cooperation between local people and modern scientists in solving the environmental and biological crises in the world is not impossible because common sense offers a venue of understanding between the simple and complex thinking of humanity.

Recent international recognition of the significance of IK in the context of scientific research, conservation and the development of alternative economic options has led to a dramatic increase in its collection and utilization by outside researchers and companies. These activities have raised concerns among indigenous people that resources and knowledge are being stolen and used without their awareness and without recognition or a share in any economic benefits that may result from the development of related commercial products. Indigenous communities are coming to realize themselves that their biodiversity and knowledge are a potential source of wealth, and they want controls placed on corporations and researchers, as well as a share in any economic benefits arising from their knowledge.

Perhaps the most commonly cited source concerning the protection of indigenous knowledge and the rights of indigenous communities on their knowledge, is the Convention on Biological Diversity (CBD). While the CBD makes general normative statements that national governments should respect indigenous knowledge and encourage the sharing of any benefits arising from its use, it does not create any specific obligations on governments concerning the mechanisms they should use to implement these norms. Nagoya protocol, which was adopted in 2010, in order to set international instrument to facilitate the implementation of ABS in IK. Other international conventions and initiatives were adopted for the rights of indigenous and local communities on their knowledge as Treaty on Plant Genetic Resources for Food and Agriculture (ITPGR), the U.N. Educational Scientific and Cultural Organization (UNESCO) Convention for the Safeguarding of Intangible Cultural Heritage, the World Intellectual Property Organization (WIPO), Permanent Forum on Indigenous Issues and Food and Agriculture Organization (FAO).

Sources of Information on IK and ILCs

This section provides an annotated list of selected resources available from libraries and the Internet related to indigenous knowledge for further reference.

Manuals

Eckman, K. 1996. **Doing Village Assessments: a Guide to Action-Oriented Village Research in Developing Countries**. Ottawa: IDRC.

This book is designed for the field staff of nongovernmental organizations (NGOs) who undertake village assessments in developing countries. While the book is clearly not intended as a comprehensive guide to structured, formal academic social research and impact assessment, it does provide a good introduction and guide for field staff charged with assessment and planning tasks and is therefore helpful for researchers. The book begins with a brief introduction to assessment, discusses some basic differences between participatory and approaches, and provides guidance for organizing tasks while in the field. Part 2 describes a variety of tools and techniques for rural assessment separated into eight chapters entitled: Basic Demographics; Getting a Historical Perspective; Learning About Land Use; Interviewing and Discussion Techniques; Understanding Sociopolitical Systems; Understanding Who Does What in Rural Communities; Rural Markets; and Assessing Natural Resources.

Grenier, L. 1998. **Working with Indigenous Knowledge: A Guide for Researchers**. Ottawa, Canada.

This guide book zeroes in on what IK can contribute to a sustainable development strategy that accounts for the potential of the local environment and the experience and wisdom of the indigenous population. Through an extensive review of field examples as well as current theory and practice, it provides a succinct yet comprehensive review of indigenous knowledge research and assessment. It is meant to contribute to the improved design, delivery, monitoring, and evaluation of any program of research. Section 1 serves as a general introduction to IK, defining concepts and outlining key characteristics of IK. Section 2 addresses some of the ethical issues in IK research. Section 3 looks at research paradigms, integrating insights from several sources into one framework for doing ethical, effective IK research. Section 4 expands on the topic of IK methodology by offering details on 31 field techniques. Section 5 presents four case studies, demonstrating different approaches to IK research in terms of research objectives and collection techniques. Section 6 deals with assessing the product of IK research in terms of sustainability and looks at developing IK through validation and experimentation. Three sets of formal procedural guidelines for conducting IK research are presented in the Appendix.

Manual for Socio-Economic and Gender and Gender Analysis: Responding to the Development Challenge. Worcester, MA: ECOGEN – Clark University.

This manual for socio-economic and gender analysis provides development professionals working as planners, organizers, educators, project managers, or community catalysts with the concepts and tools to facilitate local empowerment and capacity-building and to make their work both more effective and more appropriate to the needs and interests of local people. It introduces a conceptual framework, offers 40 tools and strategies for socio-economic and gender analysis, provides ten examples of a broad range of development activities in different settings around the world, and suggests ways to clarify objectives and to measure outcomes.

Waters-Bayer, A., Bayer, W. 1994. **Planning with pastoralists: PRA and more. A review of methods focused on Africa.** Eschborn, Germany: German Agency for Technical Cooperation.

A comprehensive description and review of participatory research in an African context. The authors first present a review of concepts and experiences in participatory planning, then offer a description of a number of participatory data collection techniques, closing with annotated bibliographies on participatory rural appraisal and using PRA with pastoralists in Africa.

On-Line Manuals and Publications

Recording and Using Indigenous Knowledge: A Manual
<http://www.PanAsia.org.sg/iirr/>

A how-to manual on indigenous knowledge research put out by the International Institute of Rural Reconstruction (IIRR). The manual is divided into five main parts: Part 1 Indigenous Knowledge and Development contains sections on defining IK, characteristics of local systems, why IK is useful, helping communities conserve IK, using IK in development, recording IK in communities, and intellectual property rights. Part 2 Recording and Assessment Methodologies contains sections on recording methods, sample selection, observation and interviewing, working with groups, using diagrams and audio-visual material. Part 3 Assessment of Indigenous Knowledge contains sections on assessing IK, criteria for assessing IK, tapping insiders' assessment, using western science methods to assess IK, and monitoring and evaluation. Part 4 Mini Case-Studies contains examples to illustrate various points, and Part 5 Question Guides contains guides to construct questionnaires/interviews for various sustainable development topics. The present Resource Kit borrows extensively from this volume.

Field Handbook: Socioeconomic and Field Analysis Programm, FAO.

<http://www.fao.org/sd/seaga/SEfh0001.htm>

This SEAGA Field Handbook is written for development agents who work directly with local communities in developing countries. The purpose of this Handbook is to support participatory development planning at the community level. It is based on actual experiences in agriculture, forestry and fisheries, but can be used by those working in all sectors of rural development. The Handbook offers three toolkits: Toolkit A- The Development Context is for learning about the economic, environmental, social and institutional patterns that pose supports or constraints for development; Toolkit B- Livelihood Analysis is for learning about the flow of activities and resources through which different people make their living; and Toolkit C- Stakeholders' Priorities for Development is for planning development activities based on women's and men's priorities. The first two focus on learning about the current situation ('what is'), while the third focuses on planning for the future ('what should be'). Each toolkit is designed to answer important questions. (FAO).

Guidelines for Environmental Assessment and Traditional Knowledge

<http://www.kivu.com/indexframe.html>

The Canadian International Development Agency (CIDA) is developing a manual to help guide its officers and partners by offering information, guidance, and suggested methodology on how to apply Indigenous Traditional Knowledge Systems and involve traditional knowledge and indigenous peoples in CIDA project or programme planning implementation. A prototype of the guidelines is available on the website, and includes three main sections: (1) Indigenous Guidelines, which are intended to inform local communities about what their rights are and how to negotiate effectively with corporations and governments; (2) Corporate Guidelines, which are meant to suggest an ethical and methodological framework for corporations working in local communities; and (3) Government Guidelines, intended to assist governments in deciding how to manage the interrelationships between indigenous people, the resources that are contained within the lands they occupy, and the market forces driving projects to extract resources. (CIDA)

Best Practices on Indigenous Knowledge

<http://www.unesco.org/most/bpikpub.htm>

This full text on-line publication, put together by Nuffic-CIRAN and UNESCO, is a contribution to efforts to show how indigenous knowledge can be put to good use in development practice. It gives examples and cases that illustrate the use of IK in developing cost-effective and sustainable survival strategies for poverty alleviation and income generation. These include indigenous land-use systems to encourage labour-sharing arrangements among farmers, using IK to increase the fuel-efficiency of local stoves instead of replacing them, and using indigenous.

Practices that might be of interest for indigenous knowledge researchers in dryland Africa are:

- Ethiopia BP.04: A semi-quantitative spatial assessment of water erosion based on limited information using expert knowledge and real-valued observations at <http://www.unesco.org/most/bpik4.htm>
- Kenya BP.06: Development Programme: Arid or Semi-Arid Lands (ASAL) at <http://www.unesco.org/most/bpik6.htm>
- Kenya BP.07: Enhancing pastoralist self-reliance through sustainable economic development at <http://www.unesco.org/most/bpik7.htm>
- Nigeria BP.10: Improving tassa planting pits - using indigenous soil and water conservation techniques to rehabilitate degraded plateaus in the Tahoua region of Nigeria at <http://www.unesco.org/most/bpik10.htm>
- Tanzania BP.12: Rangelands Utilization Strategy: utilization of arid and semi-arid rangelands by African pastoralists at <http://www.unesco.org/most/bpik12.htm>

Indigenous Knowledge Homepage

<http://www.nuffic.nl/ik-pages/index.html>

A comprehensive site created by the Centre for International Research and Advisory Networks (CIRAN), which aims to facilitate and improve the exchange of information within the International IK Network. Relevant information on indigenous knowledge (IK), scattered along the Internet, is searched, indexed and made available on the Indigenous Knowledge Pages. The focus is on World Wide Web resources (including Gopher sites), mailing lists and Usenet news groups. The site creators have searched and indexed about 200 key resources of interest to people looking for information on indigenous knowledge. Resources that offer an overview of a specific subject or are specific for one region or country can be browsed through, and a short description of every resource is given. You can browse in 'topics', 'regions' or 'organizations' to familiarize yourself with the many aspects of an issue. (CIRAN)

Indigenous Knowledge and Development Monitor (IKDM)

<http://www.nuffic.nl/ciran/ikdm/index.html>

CIRAN/Nuffic produces this on-line version of the Indigenous Knowledge and Development Monitor (IKDM) in close cooperation with indigenous knowledge resource centres around the world. The IKDM is aimed at all those with an interest in the role of indigenous knowledge in participatory approaches to sustainable development. It provides: (1) an instrument for the exchange of information; (2) a platform for debate on the concept of indigenous knowledge in a variety of disciplines; and (3) an overview of activities in the field of indigenous knowledge and sustainable development. The website provides free, downloadable electronic versions of all issues published by the IKDM. Each issue consists of two sections: (1) articles, which focus on state-of-the-art research, theory and practice, and policy in the field of IK ; and (2) communications, which is divided into the following

subsections: Resource centres, research, calls, conferences, networks, databases, publications, and films and audio-visual devices. (CIRAN)

Center for Indigenous Knowledge For Agriculture and Rural Development (CIKARD)

<http://monet.npi.msu.su/iitap-mirror/cikard/cikard.html>

The Center for Indigenous Knowledge for Agriculture and Rural Development (CIKARD) at Iowa State University focuses its activities on preserving and using the local knowledge of farmers and other rural people around the globe. Its goal is to collect indigenous knowledge and make it available to local communities, development professionals and scientists. CIKARD concentrates on indigenous knowledge systems (such as local soil taxonomies), decision-making systems (such as knowledge of which crops are best suited to particular types of soils), organizational structures (such as farmers' problem-solving groups), and innovations (such as local methods for pest control). The website includes a searchable on-line database, on-line publications from CIKARD, a listing of Indigenous Knowledge Centers of the World, and links to IK-related programs and institutions around the world. (CIKARD)

Society for Research and Initiatives for Sustainable Technologies and Institutions (SRISTI)

<http://csf.colorado.edu/sristi/>

SRISTI is a non-governmental organisation set up to strengthen the creativity of grassroots inventors, innovators and ecopreneurs engaged in conserving biodiversity and developing eco-friendly solutions to local problems. It publishes the Honey Bee Newsletter, dedicated to the theme of biodiversity conservation through documentation, experimentation and value addition and dissemination of local innovations by farmers, pastoralists, artisans and horticulturalists. Website includes an on-line database which includes issues of newsletter and research papers, an on-line discussion list, and links to other web sites. (SRISTI)

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