

Chapter 15

The Unique Character of Traditional Forest-Related Knowledge: Threats and Challenges Ahead*

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Abstract This chapter reflects on the major findings of the lead authors of this book regarding traditional forest-related knowledge (TFRK) using five criteria for distinguishing the unique character of traditional knowledge: (1) its attention to sustainability; (2) relationships to land; (3) identity; (4) reciprocity; and (5) limitations on market involvement. Following an explanation of these criteria, we discuss the definition of “traditional forest-related knowledge,” with some remarks

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about its resilience. We then consider threats to the maintenance of TFRK, how other definitions of sustainability differ from that used in TFRK, and how relationships that holders of this knowledge have to their land have been weakened and their identities challenged. We highlight how the key role of reciprocity, or the sharing of the utilization of land, is undermined by individualistic motives which are promoted by the global expansion of modern markets (for commodities, ecosystems services and for knowledge itself), which also challenge the policies of traditional knowledge holders to keep market influences under control. We then focus on two notable, but often ignored, contributions of TFRK (and the holders of this knowledge) to forest management today, specifically the preservation of biodiversity, and traditional knowledge-based shifting cultivation practices and their importance for both sustainable management of forests and food security.

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Finally, we consider enabling conditions for the preservation and development of TFRK, and examine the role of the scientific community in relation to TFRK and principles for successful collaboration between traditional knowledge holders and scientists.

Keywords Biodiversity • Cultural diversity • Forest management • Forest science • Local communities • Indigenous peoples • Sustainability • Traditional knowledge

15.1 What Have We Learned from This World Survey About Traditional Forest-Related Knowledge?

In light of the surveys provided in the regional and special issue chapters of this book, the lead authors discussed further the meaning of the term, “traditional forest-related knowledge.” While we do not see reasons to change the basic definition as originally adopted,¹ we have found that deeper understanding of the three components are possible.

15.1.1 “Traditional”

The word “traditional” carries connotations of “old” or “static” and unchanging. The authority of traditional ideas is perceived to come from their persistence and their inheritance from previous generations. As a consequence, many might perceive that adoption of new ideas, particularly of the results of science, would change and transform traditional knowledge to the point that it would lose its distinctiveness, and therefore its authority and its credibility as a unique way of knowing. What criteria can be applied to determine whether or not a particular knowledge system has retained its distinctive character even as it adapts to new circumstances and adopts tools and ideas that may have originated from outside of the particular system?

We suggest that some combination of the following five criteria can be used to distinguish the unique character of “traditional” knowledge:

1. *Sustainability*: the goal of understanding remains to maintain the sustainability of the system.
2. *Relationships*: peoples’ connections among themselves and to their territory are not severed by the use of new knowledge, ideas or techniques.

¹“A cumulative body of knowledge, practice and belief, handed down through generations by cultural transmission and evolving by adaptive processes, about the relationship between living beings (including humans) with one another and with their forest environment” (UN 2004, adapted from Berkes et al. 2000).

3. *Identity*: people maintain their distinct identity.
4. *Reciprocity*: people maintain their system of benefit sharing among themselves, and
5. *Limits on exchange*: while people may engage in market exchange with the flow of products from the land, the fundamental productivity of the system itself is not viewed as capital to be exchanged.

We now comment on each of these.

A fundamental characteristic of all of the traditional systems considered in the chapters is that the people practicing them pursue sustainability. While the particular content of the systems vary, a key aspect of their traditional character is their long persistence. Not only have the systems persisted, often in the face of significant challenges from outside, the participants strive to keep the land's productive capacity in place for the benefit of future generations

In the process of maintaining the system, a second key aspect is maintaining the relationship of people to their territory. In some situations, people believe that they are part of the territory, and that their connections cannot be severed. Others maintain that the condition of their territory is the product of their long historical relationships with it, creating what are known as "cultural landscapes". In either circumstance, adoption of new plants or animals to include in the system is constrained by the need to maintain people's relationship to that territory. For instance, when traditional hunters adopt guns to replace older methods, they still retain their attitudes of respect for the species hunted (Nadasdy 2003). This is evident in the case of the Cree and their relationships with beaver, moose and caribou (Tanner 1979). Those practicing shifting cultivation may introduce new trees to forest fallows to improve the system's productivity, while maintaining both a fallow period dominated by perennial plants and trees and a farming period dominated by annual or biannual plants. The overriding concern remains maintenance of the productivity of the system. In the Mexican tropics, for example, the rituals associated with the *milpa* system persist even if the dominant crops change away from maize, since a portion of the landscape is still reserved for maize production. In this traditional system, maize is the defining species, and to remove it totally would remove people's ritual relationship to the land (Alcorn and Toledo 1998; Toledo et al. 2007).

A third characteristic of traditional systems is that people seek to maintain their identity with respect to neighbours. Even when a community is close to losing their language and have intermarried with other groups, they maintain ways to identify themselves as a distinct community. That identity can remain even if the symbols and content of the identity change is particularly evident in Indian tribes in the United States. The people of the Confederated Salish and Kootenai Tribes of the Flathead Indian Reservation in Montana, for instance, are predominantly Roman Catholic in religion, speak English, and live intermixed with their non-tribal neighbours on a reservation on which a majority of the residents are non-Indian. But they have maintained their tribal government, increased the amount of land that they own (held in trust by the federal government), are striving to save their language, and established their own educational institutions.

The fourth characteristic, maintenance of systems of reciprocity and sharing, relates closely to retention of traditional land tenure systems. It is widely recognized that traditional societies have utilized various approaches to sharing the use of land, and recent literature has further explained the systems of reciprocity that were and are still used in such societies (Escobar 1995, 2005; Fiske 1991; Gudeman 2008; Henrich et al. 2004; Kolm and Mercier Ythier 2006; Polanyi 2001; Sahlin 1972, 1996).

The fifth characteristic is placement of limitations on the logic of market capitalism. With the expansion of the world-wide market economy, few groups have retained a position of autonomy in which they do not trade with the broader system. Many sell products that travel far from the local origin. The Menominee Tribe in Wisconsin, for example, maintains a lumber mill and harvests timber from their lands in order to supply worldwide markets with certified lumber. But they have not reduced the rotation period of the trees in their forest (150 years) to the shorter rotations that are typical of those who manage standing timber as capital (80 years). They do not regard the forest as an alternative to a bank, and retain a growing stock that is much larger than corporate forestry would keep. Rather, the forest produces multiple benefits to the current generation and is regarded as belonging to future generations. In fact, they have increased their growing stock to compensate for harvest levels that were too large early in the twentieth century. They maintain species that are not currently very profitable, and they do not let the mill management dictate foresters' decisions. The current generation cannot sell the land because they do not have that authority within their own belief system. When the US government in 1961 forced them to transfer the land to a private corporation owned by the members with individual shares, the Menominee resisted. A bank had become trustee for the children's shares, giving the bank control. As children reached voting age, community members gradually obtained sufficient voting power to control this corporation's board of directors, after which they removed the capitalist-oriented management and returned management of the land to better align with their own long-term views. In 1972, the federal government restored the reservation to their control through the Menominee Restoration Act. Today, the Menominee sell wood fibre without adopting all of the characteristics of timber corporations who manage forests only from the profits earned by growing trees (Trosper 2007).

15.1.2 “Forest-Related”

As the authors began work on this book, we agreed that the subject matter was *forest-related* knowledge, not merely forest knowledge. Our surveys for the preceding chapters demonstrated that the extent of “related” was vast indeed. Originally, the idea was that a tree-dominated landscape would have other components that would be important, such as the products of the non-tree understory. Forests provide grazing for domesticated and wild animals, fruit from trees and shrubs, habitat for mammals, birds, reptiles, amphibians, and insects, protection for the supply of

water, to make just a short list. The widespread practice of using forest fallows in farming, however, further widened the scope of “related” to include agriculture. Whether it is Mayan Indians raising corn and beans in their *milpas*, Andean Indians raising potatoes and yucca, or people in South and Southeast Asia growing upland rice, agricultural lands were definitely related to forested land. On the Kamchatka peninsula of Siberia, and on the Northwest Coast of North America, the anadromous fish of the river are also a vital part of the forest system. Proper care of the forest provides maintenance of the quality of the rivers, and proper care of the salmon provides nutrients for the forest through the uptake of nutrients brought from the ocean to the land.

15.1.3 “Knowledge”

Our work revealed some radical views of knowledge. Among the Gitsxan of the Northwest Coast of North America, for instance, leaders insist that the source of law is the land, not humans (Gisday Wa and Delgam Uukw 1992). Other indigenous peoples insist that they must listen carefully to the land to understand what it is telling them. Animals such as moose and caribou are assumed to be sentient, able to draw conclusions as a result of observing the behaviour of humans. That the creatures of the land will listen and observe human behaviour means that humans must take care in what they do. Aboriginal Australians consistently refer to themselves as belonging to the land, rather than the land belonging to them. Damage to the land is tantamount to damage to a person and can make people sick. That the source of knowledge is the land, not humans, marks a dramatic break with the epistemology normally associated with formal science. The sentience of humans is also part of the land, and the land reflects the activities and decisions of humans. This connection of humans to the land is emphasized with regard to the standards for defining tradition, as discussed above.

For most of the indigenous peoples and local communities discussed in this volume, one can assert that the idea of “nature,” as an entity separate from human society and identifiable as a subject to be studied without reference to human activity, does not exist. Often, land without human influence is maintained as “pristine” through conscious choice that recognizes the value of such places that are often identified as “sacred.”

Even while recognizing human influence on ecosystems, people have been perceived by scientists as an external modifying force and not as an integral, interacting, component of the biotic and abiotic world. This perspective supports the classical perception of two divorced entities: society and nature. The landscape is typically viewed by most ecologists as a mosaic of communities evolving to a supposed climax stage through well-defined successional paths. Humans’ actions interrupt these paths and changes the communities. Scientists in the discipline of phytosociology, which originated in Europe through the work of Josias Braun-Blanquet (1884–1980), have classified the landscape in terms of what the “potential vegetation” would be in

the absence of the activities of man. Some argue, however, that very little of the landscape in Europe (and in many other parts of the world) in fact is not a “cultural landscape,” which has reached its current condition through the history of interaction with humans. The general public is similarly confused. “Natural” and “untouched” are terms frequently used by hikers to emphasize the beauty of a country scene, even when it is in fact a deeply modified cultural landscape.

Undoubtedly, humans have continuously and substantially modified ecosystems and physical environments throughout the world, as discussed extensively in the regional chapters of this book. This long relationship between nature and human activity has produced distinguishable landscapes which reflect cultural differentiation between societies and reveal the ways that humans have responded to the exigencies of the natural environment. Recently, the Anishinaabe people of Iskatewizaagegan No. 39 Independent First Nation, in north-western Ontario, Canada, were offered a system for classifying the landscape in scientific terms by scientists. Elders insisted that while the categories seemed reasonable, the history of their own interactions with the land needed to be added as a consideration. The elders were interpreted as saying that they are “learning as they journey” on the land (Davidson-Hunt and Berkes 2003). Another kind of learning journey (in time) occurs in northeastern India, where those engaged in shifting cultivation have reduced the length of the fallow period and changed the amount of forest cover in response to many changes resulting from population and income growth (Ramakrishnan 1992). Similarly, studies in Amazonia have discovered a deep history of the presence of humans in the forest. The current character of the forest is a consequence of that history, which must not be forgotten in dealing with the Amazon. In India, distinct tribal groups have generated their own landscapes through their histories. These separate areas can be described as “natural cultural systems” which their inhabitants value highly and protect in various ways (Ramakrishnan 1992; Ramakrishnan et al. 2006).

Another aspect of the traditional forest knowledge system highlighted in our surveys was the degree of integration of multiple uses of the forest, what is often described as a “holistic view” of the landscape. This holistic view accommodated the attention given to so many things that were related to the forest but were not the trees themselves.

In summary, each of the three components of the topic of this volume marks very distinctive ideas with considerable depth. It is perhaps remarkable that these characteristics were found to be shared among traditional peoples on all of the continents that we have surveyed.

15.1.4 Resilience of Traditional Forest-Related Knowledge

A characteristic of the socio-ecological systems that have produced traditional forest-related knowledge is their resilience and adaptability. Since traditional societies are highly dependent on these systems, they often have developed management

practices and local institutions that are able to adapt to environmental and other challenges, whether internal or external. The climate change chapter stressed this characteristic of traditional systems. The capacity to adapt can be examined in three dimensions: the ability to rearrange and relocate particular landscapes, the ability to select and modify habitats within landscapes, and the ability to utilize knowledge of species to adjust the mix of species utilized within habitats. All of these capacities are the result of TFRK. The result of the capacity to adapt is the ability to maintain levels of ecosystem services, quantities of products produced, and other system outputs, among which is inspiration.

As a consequence of this adaptive capacity, the societies and the socio-ecological systems in which TFRK developed have good records of survival. In some cases these records can be substantiated through written sources, as in Europe and Asia. Where written records do not exist, survival and persistence can be demonstrated through a combination of archaeological evidence and oral histories.

Some of the noteworthy examples of the prior resilience of these systems were described in the preceding chapters. For instance, shifting cultivation has a long history and has occurred in Africa, the Americas, Europe, Asia and the Pacific in a wide range of tropical, subtropical, and temperate forest ecosystems. For example, the Iroquois corn-bean-squash fields were planted on lands subject to shifting locations in the northern hardwood forests of North America. In Chile and Bolivia indigenous peoples used potato, yucca and corn. In India, over 100 groups have relied for countless generations on shifting cultivation (*jhum*) systems (Ramakrishnan 1992). In the mountainous area of mainland Southeast Asia the long history of shifting cultivation casts doubts on the ‘primary’ character of forests located in accessible areas. In this region shifting cultivation has promoted fairly stable secondary forest vegetation characterized by complex, dynamic and structurally diverse successional stages (Fox 2000).

15.2 Threats to Traditional Forest-Related Knowledge

The previous section began with a list of five characteristics that maintain the “traditional” component of traditional forest-related knowledge: sustainability, relationships with land, identity, reciprocity, and limits on exchange. Although the international interest in sustainability has probably contributed to the current growing interest in TFRK, some of the characteristics of the “traditional” character of TFRK are also the sources of its vulnerabilities.

Regarding sustainability, perhaps the largest challenge relates to the core concept of sustainability itself. For example, the Menominee Tribe in Wisconsin has long been interested in sustained yield management of its forest, and has created a Sustainable Development Institute as part of the College of the Menominee Nation. The Menominee do not define sustained yield in the manner used by the forestry profession, i.e., based on maximum sustained yield or maximization of soil expectation value. The Menominee maintain a growing stock much larger than would be

calculated with maximum sustained yield, and thus reduce the growth rate of their forest. They desire to grow large trees and maintain a diverse, structurally complex, forest. The Menominee definition of sustainability involves the idea that they are borrowing the forest from future generations, and seems to correspond roughly to the idea of “strong sustainability” from ecological economics. It means including all the capacity of land, and not just the production of commodities or ecosystem services. This broad definition is challenged by less strict definitions, which can lead to unsustainable policies (Norgaard 2010).

The idea of sustainability supported by scientific approaches to forest management differs from that based on traditional knowledge. The scientific idea of sustainability originated with the success of one type of scientific forestry—the system developed in Germany starting in the sixteenth century. This led to the export of the ideas of ‘scientific forestry’ to other parts of the world, with the accompanying idea that local knowledge was not valuable (Michon et al. 2007). Scientific forestry was much liked by national governments, as well as colonial governments (from the mid-nineteenth to mid-twentieth centuries). Because of its appeal, governments sought to rationalize the management of forests by removing uses that seemed to contradict or interfered with the primary goal—growing timber. Because the scientific approach supported the interests of states, colonizing powers and post-colonial governments worldwide, both science and the state have played key roles in reducing the use of TFRK in forest management. Thus, sustainability has evolved from a concept concentrating on the level of wood production, or yield, to the present, more comprehensive concept integrating ecological, economic and social aspects of forestry.

The idea that local knowledge was not valuable and that wood fibre production should dominate under a sustained yield forest management regime also began the process of severing connections between local people and the land, the second of the major issues that relate to the maintenance of traditional knowledge. Other factors, including the spread of centralized monotheistic religions (particularly Christianity and Islam) and the modern idea of “nature” as separate from humans also contributed to separating traditional people from their land.

Throughout human history, religion has been abused to justify active suppression of alternative ideas and fuel conflict. Traditional communities, and particularly indigenous peoples and their conceptions of their place in the world and their relationships to forests, have long been on the receiving end. During the European (and later American) global colonization process from the early sixteenth to twentieth centuries, many religious leaders opposed spiritual ideas that differed from their own. Local religious perspectives, including ideas of the sacred in forests, were frequently suppressed and replaced by those of centralized, “top-down” religions. Missionaries sought to change local religions and practices, labelling beliefs in forest deities as “animistic” and not consistent with the monotheism. In the Americas, for example, Christian religion in its varied forms accompanied colonization from 1492 onwards. While European settlers sought to subdue the wilderness and realize economic gain from cutting down forests, Christianity provided justification for man to conquer and dominate the natural world. While traditional people located the sacred

in the landscape, for various reasons, religion located it in human-constructed dwellings and in organizations that were exclusively managed by humans.

An important and highly influential image from the Bible is that of the Garden of Eden, a land of great beauty and productivity given to the first humans for their use. In the twentieth century, the idea of Nature acquired Edenic associations. The idea evolved that “pristine” Nature has values for humans, not just for recreation, but for personal development (Shutkin 2000). Recently, pristine nature is seen to provide benefits for humans by preservation of biodiversity. This idea motivates governments to set aside such areas by excluding all uses except visitation. These places, while special, weren’t consciously described as “sacred” in the sense of being like the altar in a church. For people in traditional communities, accustomed to living in their sacred lands and protecting their sacred groves, the idea of protecting a landscape from human influence has often had serious consequences. In many cases it meant that they would be removed (as they often have been removed from designated “protected areas” worldwide), just as they are removed from landscapes being developed for economic purposes.

Thus, both applying a narrow definition of sustainability and separating local people from their land undermine traditional forest-related knowledge. A third way to reduce the effectiveness of TFRK is to undermine identity through efforts that result in deculturalization. For example, campaigns of major proselytizing religious sects to displace local concepts of spirituality also contributed to undermining the identity of traditional peoples by changing their religion. Another major factor undermining identity has been national education systems which interfere with the inter-generational transfer of traditional knowledge and wisdom between elders and youth. While not necessarily a global force, we note that the role of youth as people to carry on TFRK is important. In many regions, the holders of TFRK (particularly elders) are attempting to pass along their knowledge and wisdom to the next generation. Women, as holders of knowledge, are responsible for raising children, which provides them with opportunities to impart their knowledge to the very young. Recently NGO organizations are supporting efforts to pass on traditional knowledge and revitalize traditional cultures and languages. Communities are increasingly demanding that researchers, in sharing benefits from research, support documentation of traditional knowledge as well as development of curricular materials. Communities also develop educational media themselves.

In spite of these efforts, we also find that complex pressures are making the cultural transmission of traditional forest-related knowledge difficult. Children often leave their home villages as they pursue education above the primary level. Consequently they miss out on opportunities to obtain profound knowledge from their elders of traditional socio-ecological systems. Urban centres have other appeals besides education, particularly employment. When educated indigenous people become activists for issues of importance for their communities, they generally remain in the urban centres where resources and media are available. While their activism helps protect their original communities, the activists themselves are less likely to participate in traditional knowledge production systems.

The chapter on globalization stressed that the international spread of market institutions contribute to reduction in the utilization of TFRK. It does so because market institutions tend to undermine the final two of the five characteristics that define tradition, namely reciprocity and limiting markets. The idea of reciprocity emphasizes community obligations, both of individuals to their community, and of the community to individuals. Modern market concepts are connected to individualism rather than community. The exclusion of some activities from being governed by market considerations conflicts with the views that market relations can or should cover all forest values. This issue is relevant to a number of policy discussions, including those related to markets for environmental services such as carbon, discussed in the chapter on TFRK and climate change.

Ideas of individualism undermine reciprocity in several ways. As noted above, colonial governments harvested timber over large forest areas for revenue, displacing the traditional residents. In places where the governments did not assert control over forests, conversion of common land to private land, followed by sale of land as property, contributed to displacement of local people from the use of that land. The idea of private property asserts that the owner has full control of the surplus generated from the land, while ideas of reciprocity mean that the surplus is distributed in complex ways to community members. Even the idea of "common land" becomes distorted under the influence of individualistic ideas. "Common land" is frequently thought of as open access land, in which individuals have are free to remove products without community controls on that access. Of course, excessive harvest is an expected result when controls are not present. But traditional land tenure systems are more complex. Hunters are forced to share their catch with relatives, thus reducing the individual incentive to overharvest, while at the same time revealing the amount harvested to public scrutiny. When needed to encourage investment in land productivity, families and individuals may be given exclusive control of parts of the land, under the assumptions that they will share a portion of the harvest and that if they cease to use the land, it returns to the community to be allocated to others. With flexible community-based systems of allocating access to land, excessive division into small parcels could be avoided through community leadership. This kind of flexibility, for instance, is part of many systems of shifting agriculture in which land is allocated to families when farmed, but allocated to other uses when fallow.

When land is part of a system of reciprocal relationships, identifying a unique owner who can sell the land becomes difficult. The whole community has interests in all of the land, and as a result the whole community needs to participate in decisions as momentous as selling a community's land. Many indigenous communities simply refuse to consider land to be a marketable commodity.

This limitation on the sale of land is a part of the fifth and final characteristic of tradition—the placing of limits on the extent to which market relations are allowed to penetrate and affect land use decisions. When some land uses are not valued in markets, then prices are not available for judgment about how to use the land for those purposes. Profit-maximizing calculations cannot be made easily. Those products that a community allows for sale are marketed. The prices received for such products depend upon broader market considerations, and one reason that communities limit

their interaction with markets is that such limitations reduce risk connected to prices dropping unexpectedly. Market logic encourages specialization in the products whose current market price is highest, which exposes a community to risk resulting from declines in such prices.

Thus all five characteristics of traditional knowledge – strong sustainability, human connection to land, community identity, reciprocity and control of market relationships—are threatened in the modern era. In spite of these difficulties, the people and their systems that support TFRK have persisted. As a result, they have made contributions to sustainable forest management. The next section considers two such major contributions.

15.3 Contributions of Traditional Forest-Related Knowledge to Sustainable Forest Management and Forest Science

Two areas in which TFRK has made, and continues to make, major contributions to sustainable forest management are the protection of biodiversity and the development and utilization of shifting cultivation practices. This section reviews the contributions of the holders and users of TFRK in these areas, and concludes with a brief summary of other contributions to sustainable management of forests and associated ecosystems.

15.3.1 Conservation and Sustainable Use of Biodiversity

Traditional knowledge holders have a strong record of protecting and even enhancing the biodiversity of their homelands (Belair et al. 2010). The identification and protection of important species, the protection of important plant communities (as in sacred groves), advice on dealing with catastrophic processes such as fire and flood; these are all important ways to support biodiversity. Very often, culturally important species are also ecological keystone species in addition to cultural keystone species. The protection of important forest areas in general, and of areas that are important during key times (such as calving for mammals or spawning for fish) are another characteristic of TFRK. Sacred groves in Asia and Africa are a prime example of such protection. Sometime sacred areas are important for the delivery of ecosystem services, especially water. In other cases, they serve as vital refuges for a variety of valued plant and animal species, including plants used in traditional (and modern) medicine.

Conservation biology owes much to conservation by indigenous peoples, and to knowledge regarding the life history of significant species. For instance, management and preservation efforts species of giant turtles in the Amazon has required knowledge from local people to identify what was needed for their conservation.

Woodlands and trees traditionally used and managed by local communities have important effects on biodiversity.

The open oak-wooded pastures of Mediterranean countries, called *dehesas* in Spain and *montados* in Portugal, are an excellent example. The ecotone nature of these woodland ecosystems allows the development of their characteristically high biological diversity (Campos et al. 1998; Díaz et al. 1997). These woodlands constitute a principal refuge for several rare or endangered bird species in Europe, including the Spanish imperial eagle (*Aquila adalberti*), the cinereous vulture (*Aegypius monachus*) and the black stork (*Ciconia nigra*). A significant proportion of the population of Western European common cranes (*Grus grus*) overwinters in the Spanish *dehesas* (Muñoz-Pulido 1989). These wooded pastures also support a variety of cavity-nesting bird species that utilize sites in the branches of old managed oaks (Pulido and Díaz 1997).

It is perhaps no accident that there is a strong correlation between the location of the world's centres of forest biodiversity and the cultural diversity represented by indigenous peoples who live in these areas (Galloway-McLean 2010), as discussed in Chap. 1. A high percentage of “biodiversity hotspots” have high resident indigenous peoples, who have maintained and will continue to maintain biodiversity of these areas provided they are allowed to continue their practices. For example in the Brazilian Amazon where, according to Nepstad et al. (2006): “indigenous lands were often created in response to frontier expansion, and many prevented deforestation ... despite high rates of deforestation along their boundaries. The inhibitory effect of indigenous lands on deforestation was strong after centuries of contact with the national society and was not correlated with indigenous population density. Indigenous lands occupy one fifth of the Brazilian Amazon—five times the area under protection in parks—and are currently the most important barrier to Amazon deforestation”.

Management of formally designated protected areas can be carried out effectively in collaboration with indigenous knowledge holders. Examples of this can be found in the Americas, Africa, Asia and the Pacific. For instance, Gwaii Haanas, a park on the coast of British Columbia, is jointly managed by the Haida and Parks Canada (Mabee et al. 2010). Compared to the situation in other Canadian parks, the Haida have considerable influence on conservation outcomes in Gwaii Haanas (Timko and Satterfield 2008; Timko and Innes 2009). In Brazil, sustainable development reserves, extractive reserves, and indigenous territories all implicitly acknowledge that traditional knowledge is useful for management.

15.3.2 *Shifting Cultivation Systems*

In the area of shifting cultivation, traditional forest-related knowledge has been instrumental to the recent advances in the management of fallow periods (between rotations of agricultural crops). The value of properly conducted shifting cultivation,

particularly in the tropics, has not yet been generally recognized, and these practices still have a bad image in forest management and forest science circles in most countries. This is in spite of recent scientific research that has demonstrated the ways in which shifting cultivators optimize the productivity of their agro-forest systems. For instance, indigenous communities in Mexico have a strong record of applying shifting cultivation successfully (Alcorn and Toledo 1998; Toledo et al. 2007). Shifting agriculture in Yunnan, China has become modernized into a new rotational agroforestry system that is able to sustain the natural resource base in mountainous areas (Liang et al. 2009).

Shifting cultivation's poor reputation is due to its being unfairly blamed for forest degradation which had other causes. Evidence compiled in India indicates that the real causes of degradation have been forest harvesting for export and increased intensity of agricultural use of formerly forest lands, rather than shifting cultivation. Similarly, a study by the National Academies of Science of the India, China and the US concluded that economic pressures and related changes in land use, not population growth, are the principal underlying causes of forest degradation in these three countries (Indian National Science Academy et al. 2001).

A similar situation exists in Southeast Asia, where national policies have banned shifting cultivation and international development agencies have pressured governments to eliminate or transform indigenous agricultural practices. Fox (2000) reports that areas of swidden (i.e., shifting) agriculture have a richness of animal and plant species compared to other areas, that 77–95% of the landscape in five study areas had secondary forest, and that the system is characterized by stability over the large area even though it is dynamic and structurally diverse. Permanent agriculture, by comparison, creates permanent deforestation.

In the scientific literature, there is growing evidence that shifting cultivation as well as other traditional agro-forest management systems have high productivity for the amount of energy and other inputs that they utilize (Sieferle 2001; Tello et al. 2006). The high productivity is realized because of multiple outputs, not all of which are valued in markets, and not all of which are recognized because they occur during the fallow period. The high productivity of other agricultural systems is often based upon inputs of energy (mechanization, irrigation and fertilizer) which have uncounted costs that raise issues of sustainability (Ramakrishnan 1992), including their contributions to climate change through greenhouse gas emissions. Traditional and improved shifting cultivation and agroforestry systems offer distinct advantages (for sustainable agricultural production and biodiversity conservation) over the more intensive farming systems that frequently replace them, particularly in fragile mountain environments (Cairns 2007; NEPED and IIRR 1999; Palm et al. 2005; Swift et al. 1996).

Although the economics-oriented forest science literature used to focus on the optimization of a single product (wood fibre), another more recent ecologically-oriented part of the forest science literature emphasizes multiple products and services from forests. As a result, forest science has become more open to the recognition of the value of shifting cultivation and agroforestry systems than are the more product-oriented agricultural sciences.

Another set of reasons for non-recognition of the value of shifting cultivation result from the resistance from governments, which usually have a great difficulty with mobile communities. This includes the traditional farmers who practice shifting cultivation, as well as those who practice transhumance² which is sometimes associated with shifting cultivation. In addition, burning the forest prior to planting, an important part of most traditional shifting cultivation cycles, is generally difficult for governments and the public to accept. This intolerance is increasing as concerns for climate change increase, and burning forests appears to reduce carbon storage. In some countries, shifting cultivation is illegal.

Shifting cultivators are in many regions modifying their management practices while retaining the principle of using forest during the fallow period between agricultural phases (Palm et al. 2005). Such innovations include the abandonment of the use of fire for forest clearing, and planting of new species (forest trees and other valued plant species) in cropping and fallow management. Examples of such changes are documented in the regional chapters for India, China, several countries in both Southeast Asia and Africa, and in Mexico.

Thus, traditional forest-related knowledge has made significant contributions to biodiversity conservation and to the modernization of shifting cultivation and agroforestry systems. Such knowledge has contributed to, and could continue to advance, scientific understanding and forest management applications in a number of other areas. These areas include landscape history, climate change, and geographical information systems to be discussed below.

15.3.3 Landscape History, Climate Change, and Geographical Information Systems

Studies of landscape history can use social science methodologies to reconstruct the stories of what areas used to look like. In southeastern Spain, interviews of elders provided alternative reasons and explanations for historical changes in forested landscapes which differed from those which scientists had derived from their examination of current ecological study data (García Latorre and García Latorre 2007). In this case, scientists attempted to reconstruct past forest ecosystem composition and structure based on present floristic composition, without taking into account the management applied to these woodlands by peasants. Peasants interviewed in several mountain ranges in southeastern Spain have shown how oaks as well as many other tree and shrub species in these mountains have been traditionally pollarded, coppiced or shredded (activities never mentioned by phytosociologists, who focus only the current floristic composition). Peasants described the landscape of their youth as

²Transhumance refers to the seasonal movement of people with their livestock typically as for example in the Himalayan and Alpine regions when herds are moved to higher pastures in summer and to lower valleys where herders have permanent settlements in the winter.

completely cultivated (woody vegetation having been largely eliminated to supply fuel wood needs). The matorral shrublands studied by phytosociologists, which led to erroneous conclusions about past vegetation structure in the region, did not exist in this region prior to the mid-twentieth century, having developed as a consequence of rural abandonment. By incorporating the oral histories into studies such as this, more complete and accurate reconstructions of landscape histories are possible.

Similarly, within indigenous communities on the coast of British Columbia, the oral histories of lineages are carefully monitored for accuracy at feasts. Although these histories maintain the sequence of events, the timing tends to be lost. Archaeologists can date events precisely, while the oral histories provide details on what occurred. Another contribution of traditional knowledge to understanding landscapes is provision of an appropriate method of classifying habitats, as has occurred in the Amazon. These classification systems include information about how humans have modified the landscape.

Regarding phenology and other ecological indicators of climate change, traditional forest-related knowledge has an obvious role to play in the monitoring and analysis of environmental change and its implications for traditional forest-based livelihoods (Parry et al. 2007; Salick and Byg 2007; Galloway-McLean 2010). For instance, Chief Millaman Reinao of the Mapuche in Chile reports that his people have observed many differences in the timing of seasons (Reinao 2008). In Russia, indigenous peoples traditionally used observations of plant phenology (i.e., flowering and fruiting behaviour) to determine when it was time to start hunting. For example, for the Udihe and Oroch peoples of Siberia, changes in larch indicated that it was time to begin their fur hunting season; the flowering of dog rose blooming was an indicator of the initiation of salmon spawning; and a rich harvest of Siberian pine nuts was a sign of that a good hunting season for fur and hooved animals was ahead.

The utilization of Geographical Information Systems (GIS) is an area of increasing collaboration between scientists and traditional knowledge holders. Maps are a useful way to depict land uses, and the associated data bases are excellent ways to include information from both science and traditional knowledge. Maps can also be used to demonstrate changes over time, both by reproducing what has occurred in the past, and by projecting potential futures. However, care is needed when some of the information obtained from traditional community members is confidential (as discussed in the chapter on research ethics and methodologies). The collaborators on the Foothills Model Forest (now the Foothills Research Institute) in Canada, for instance, provided that some of the information remain under the control of the indigenous partners. Proposed developments would be provided to those partners, who then would report the areas in which conflicts of use existed, without revealing exactly what the indigenous use was. This is needed both for protection of sacred areas and for protection of cultural information. While GIS data bases present a risk similar to information registers, these risks can be addressed by developing adequate controls over the access and use of information from traditional community sources.

15.4 Enabling Conditions for the Preservation and Further Evolution of Traditional Forest-Related Knowledge

While empowerment of local people can support the retention and utilization of traditional knowledge, such policies are not often possible. Two examples concern the relative autonomy of the Menominee Tribe in Wisconsin, and the self-governing powers of lowland indigenous groups in Mexico. Policies that fall short of full empowerment can still have positive effects. For example, in Europe, farmers receive subsidies when they engage in maintenance of traditional agricultural landscapes by organic farming. Similarly, “green agriculture” states in the mountains of India support utilization of traditional knowledge.

Some policies that appear to be designed for preservation of traditional knowledge are resisted. For example, the establishment of knowledge registers does not always receive support by local communities (Agrawal 2002). An example of this occurred in Russia in connection with the UNDP project, “Biodiversity Conservation in the Russian Portion of the Altai-Sayan Ecoregion” (UNDP Focus Areas 2011; Altai Regional Institute of Ecology 2007.). The FAO’s “globally important agricultural heritage systems” program has met similar resistance from local people in some countries; the basis of the problem is that the FAO works with governments, while local people are suspicious of their government’s further exploitation of their knowledge without compensation. The Traditional Knowledge Information Portal of the Convention on Biological Diversity³ avoids this controversy by stating it “does not provide or document traditional knowledge per se.”

Those interested in traditional forest-related knowledge are often concerned that once lost, it cannot be recovered. The process of forgetting has several stages, and if the existence of the lost knowledge can be recognized at an early stage, living knowledge-holders can be encouraged to revive it. Drivers of the recovery of fading knowledge are the recognition that a problem might have already been solved and the solution be found (or remembered) among remaining knowledge holders. Market demand for traditional products such as baskets can lead to recovery of knowledge related to techniques for harvesting or cultivating plants used for these purposes (Lake 2007).

In North America, some indigenous peoples concerned about the bad health effects of modern foods are seeking to improve their diets by returning to traditional crops and plants harvested from the wild. This provides an impetus for exploring methods of tending plants in the wild, such as berries, wild rice, and other foods. It also enhances the role of elders needed to train the youth in proper harvesting techniques (MacPherson 2009).

When knowledge has apparently been lost in one area, it may have been retained in others. A case occurred in the early twenty-first century in Austria when a windstorm destroyed a forest that had protected a very busy highway

³CBD Traditional Knowledge Information Portal: <http://www.cbd.int/tk/about.shtml/>

down-slope. Because of the topographic situation and the heavy road traffic, the timber could not be removed by cable logging. As there were only a few loggers in Austria able to bring the logs down from the hillside by gravity, the forest administration asked Romanian loggers to carry out this task. Their predecessors (farmers and loggers) had been Austrians who were expelled from their home in the Austrian mountains in the eighteenth century due to their religious beliefs (as Protestants). On the advice of the Austrian Emperor they were resettled in Romania. After more than 200 years members of these communities maintained not only their culture but also the traditional knowledge related to logging and timber transport on steep slopes.

The Indian government's desire to strengthen intellectual property protection and prevent the patenting of plants traditionally used in Indian systems of medicine (i.e., Ayurveda, Unani and Siddha) led to a large project to document the uses of these plant species.⁴ At the local level, 'people's biodiversity registers'—consisting of records of individual people's knowledge of biodiversity, its use, trade, and efforts for its conservation and sustainable utilization—have been established. These registers are recognized in the Indian Biological Diversity Bill of 2000. These developments have led to both recovery and preservation of traditional knowledge in India.

15.5 The Role of the Scientific Community

The scientific community has shown increasing interest in traditional knowledge, evidence of which is presented below. Mutually beneficial and ethically acceptable collaboration between holders of TFRK and scientists, however, has to address three main sources of power imbalance between scientists and holders of TFRK: differences in intellectual prestige, differences in access to funding, and differences in access to political power. The second part of this section addresses these power imbalances, followed by a discussion of how collaboration among scientists and holders of traditional forest-related knowledge can proceed by taking into account these power imbalances.

15.5.1 *Scientific Interest*

There is a long history of interest in traditional knowledge within social science disciplines such as anthropology, and among biological scientists working in the field of ethnobotany. However, research within the biophysical sciences such as ecology,

⁴See Traditional Knowledge Digital Library. Available online at: <http://www.tkdlib.org/tkdlib/langdefault/common/home.asp?GL=Eng>. Cited 10 April 2011.

forestry, and agriculture is relatively recent, mostly dating from the 1970s. Although many scientists over the years have been indifferent to traditional knowledge, or regarded it as somewhat inferior to the knowledge generated by ‘modern’ science, some increase in recognition has occurred recently. For example, recent publications in ecology, such as the two editions of Berkes’s *Sacred Ecology* (2008) and a special issue of the journal *Ecological Applications* in 2000 (Ford and Martinez 2000) show increasing respect for traditional knowledge among a growing number of scientists.

Within the global forest science community, traditional forest-related knowledge has been increasingly addressed by the International Union of Forest Research Organizations (IUFRO). IUFRO World Congresses since 1985 onwards have included TFRK-related sessions, particularly those organized by IUFRO units that focus on social and policy science. The IUFRO Research Group Forest and Woodland history, which has been active for decades, has increasingly focussed on traditional forest-related knowledge. At the 2010 IUFRO World Congress 2010 held in Seoul, two Working Parties on traditional knowledge were established within this Research Group, building on its close collaboration with the IUFRO Task Force on Traditional Forest Knowledge⁵ between 2005 and 2010 (Fig. 15.1).

As Berkes points out (2008, 13–15), philosophical and political differences become intertwined, with the political differences at times the more important. The holders of TFRK are usually politically weak and the scientists strong. Thus a scientist can assert that scientific knowledge justifies the scientist speaking “for nature”. This contrasts with local people, who claim that their intimate knowledge of their landscape gives them the justification to speak for it.

15.5.2 Differences in Power

The use of traditional forest-related knowledge in decision-making processes should be based on a partnership in which TFRK owners, scientists and policy makers create and share knowledge (Berkes 2004; Colfer et al. 2005). However, there is considerable potential for misappropriation of such knowledge and its eventual loss by the original holders (ICSU 2002). The issue may be framed as the scientists’ responsibility, vis-à-vis their acknowledged interests, values and aspirations. Alternatively, it may be seen as a matter of scientists as employees or persons allied with powerful groups which are interested in resources or knowledge controlled by traditional knowledge holders. How much of the responsibility to behave properly resides with the researchers and how much with the community holding the traditional knowledge? What does the responsibility consist of and which methods should be applied to study TFRK in a mutually fruitful, yet ethically acceptable, manner? Agreements (oral or signed) should cover the scope of research, methods and tools that can be used, rules for meeting and talking with

⁵<http://www.iufro.org/science/task-forces/former-task-forces/traditional-forest-knowledge/>

participants, reporting research results back with those who shared, and payment for their assistance and services, possible benefit-sharing, and acknowledgement in publications and other forms of dissemination.

Prominent and recent examples of relevance for the study of TFRK include the Convention on Biological Diversity's "Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization" (SCBD 2011), which includes traditional knowledge associated with genetic resources that is held by indigenous and local communities and the CGIAR-led initiative to identify key research ethics and IPR challenges (CGIAR 2009). Requirements that forest concessionaires and others utilizing indigenous lands undertake significant consultation and accommodation of the interests of the knowledge holders has been a principle put forward and followed to some degree. In Russia, for instance, a special law was passed requiring forestry companies to involve the community and scientists in the planning of their timber harvests destined for export (Forest Club 2011). In Canada, the courts are asking that the Provinces significantly consult with indigenous peoples when their aboriginal rights are threatened, and to accommodate those rights by modifying planned activities (Christie 2006).

While scientists are not necessarily in control of decision-making regarding development of forested lands, they have more control over curriculum and programmes within universities. Cooperation is developing both in research and in course content. At the international level, for example, United Nations University–Institute of Advanced Studies' Traditional Knowledge Initiative supports research activities, policy studies, and capacity development related to traditional forest-related knowledge. In Italy, the Engineering and Forestry Faculties at the University of Florence have created a centre for the innovation of local and indigenous systems of knowledge that explores the usefulness of traditional knowledge. In Canada, the Natural Resources Institute at the University of Manitoba has a successful research relationship with the elders of the Pikangikum First Nation. The Faculty of Forestry at the University of British Columbia is in its second strategic plan for its Aboriginal Initiative, which includes both research and the development of a specialization in Community and Aboriginal Forestry. The Faculty also works with the Haida Gwaii Semester in Natural Resource Studies in providing university credit for the courses that are taught at Haida Gwaii.⁶ The University of Northern British Columbia and the Tlazt'en First Nation jointly manage the John Prince Research Forest near St. Johns, British Columbia (Grainger et al. 2006).

15.5.3 *Collaboration*

Collaboration is not an easy task when differences in relative power and difference in world views need to be accommodated. If ethical and methodological questions are not addressed in a consistent and systematic manner from the outset of the

⁶www.haidagwaiisemester.com

research, the rights of TFRK owners may well be infringed, meaning that benefits will not accrue to the owners, and that access to resources (e.g., genetic resources) may be suddenly curtailed. Thus, all parties must address the challenges raised by the maintenance, use, and protection of TFRK when there is interaction between the holders and users of such knowledge.

Our chapter on research ethics pointed out that communities are more and more insisting that research be conducted under conditions controlled by written protocols and the free informed consent of the TFRK holders who are involved. In particular that includes free and prior informed consent (FPIC) as well as access and benefit-sharing and active traditional knowledge protection efforts. It is also worth noting that successful efforts have been made to facilitate greater engagement with forest peoples by describing a research methodology, considering so-called *etic* and *emic* approaches for the study of traditional forest-related knowledge.⁷ A key point is that careful consideration of the cultural context is of utmost importance when studying TFRK, and when choosing methods to do so, because insiders and outsiders ask different questions (Bishop 2005).

The principles governing ethical research can be applied also to collaboration in forest management. Factors that support successful collaboration are agreement on the goals of management (especially when everyone is concerned with sustainability), respect for cultural and disciplinary differences, wide participation in determining research questions, and sharing of power in decision-making. As was pointed out in the chapter on research ethics, these principles can be interpreted in various ways, so both researchers and the community bear responsibility and should take a strong interest in considering and abiding by these principles. However, an important challenge remains to clarify how such guidelines are best enforced.

15.6 Conclusion

In this era of increased concern about sustainability and sustainable management of forest ecosystems, traditional forest related knowledge has an increasingly important role. In this book, we have documented how people around the world have maintained their connections to their lands and cultures. Although many challenges exist, as have been described in the chapters, scientists are recognizing that traditional knowledge presents more than information to calibrate their own models; traditional forest-related knowledge offers ways to understand based on world views that have persisted precisely because the knowledge (including its assumptions, facts, and values) is valid. In struggling to maintain their way of life and identity,

⁷*Etic* (not to be confused with *ethic*) implies an outside perspective on the culture or system, using prior (and in this context, scientific) knowledge and one's own (here: research) vocabulary to describe and understand in a neutral or objective way. *Emic* means that the researcher looks at a culture or system from the inside in the sense that she or he assembles a description that can be recognized and verified by those within the system who hold the knowledge.



Fig. 15.1 Participants of the lead authors' meeting held at the headquarters of the International Union of Forest Research Organizations at Mariabrunn, Vienna, Austria in November 2010. *Standing (left to right):* Jesús García Latorre, Miguel A. Pinedo-Vasquez, Elisabeth Johann, Ronald Trosper, Vladimir Bocharnikov, Renate Prüller (IUFRO headquarters), P. S. Ramakrishnan, Mónica Gabay. *Front row (left to right):* Andrey Laletin, Mauro Agnoletti, John Parrotta, Lim Hin Fui; *Missing from photo:* Suzanne A. Feary, Christian Gamborg, Alfred Oteng-Yeboah, Youn Yeo-Chang

traditional knowledge holders have engaged in political processes at local, national and international levels.

The great diversity of local systems precludes strong generalizations about the contributions of traditional forest-related knowledge. This concluding chapter highlighted biodiversity conservation and shifting cultivation as two areas of significant contributions. We can attempt the generalization that the relationship between TFRK and 'formal' science has been hampered by both the philosophical underpinnings of Western science and the historical alliance between national governments and scientists. Seen as key to national economic growth, forest science in support of forest management to maximize timber production or, more recently, biodiversity conservation, used to ignore or even oppose analysis based on traditional knowledge. But experience has demonstrated the wisdom of much of traditional knowledge, leading to a shift of the relationship between traditional forest-related knowledge and other forms of knowledge.

As a result, scientists are increasingly interested in traditional forest-related knowledge. Models have emerged to guide reasonable collaboration among scientists and traditional knowledge holders. Such collaboration is also valuable for involving all local people. Many of these examples are explained in our chapters. While much remains to be done, this book demonstrates much has been accomplished.

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