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To cite this article: John Parrotta, Youn Yeo-Chang & Leni D. Camacho (2016): Traditional knowledge for sustainable forest management and provision of ecosystem services, International Journal of Biodiversity Science, Ecosystem Services & Management

To link to this article: <http://dx.doi.org/10.1080/21513732.2016.1169580>



Published online: 04 Apr 2016.



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EDITORIAL

Traditional knowledge for sustainable forest management and provision of ecosystem services

Forests, and the people who depend on them, are under enormous pressure worldwide. Deforestation in many parts of the world continues at an alarming pace, the result of agricultural conversion for food and industrial crops such as oil palm, livestock production, mining, and energy and industrial infrastructure development. Forest degradation is even more widespread, leading to more gradual losses of biodiversity, forest structure, ecological functioning, and provision of ecosystem services. Biodiversity loss, climate change, pollution, water shortages, and environmental conflicts lessen the capacity of forest landscapes to provide the environmental goods and services that underpin food security and other basic human needs. Faced with these problems, and considering their origins, many question whether the science and technology that currently shapes our lives and the management of natural resources is up to the task of building a truly sustainable future. Perhaps, as Albert Einstein suggested: 'The world as we have created it, is a process of our thinking. It cannot be changed without changing our thinking.'

Fortunately, there are other sources of knowledge and wisdom to draw on in our collective quest for sustainable natural resource management. Long before the development of modern forest science and 'scientific' forest management in Europe in the early nineteenth century, local and indigenous communities throughout the world managed forests and associated landscapes in countless ways that sustained their livelihoods and cultures, without jeopardizing the capacity of these ecosystems to provide goods and services for future generations. The knowledge, innovations, and practices of these communities evolved through various experiences gained over centuries under changing environmental, economic, political, and social conditions. Typically, this traditional knowledge has been transmitted orally from generation to generation, often in the form of stories, songs, folklore, and proverbs, as well as direct training of youth by elders. Traditional knowledge – supported by and embodied in local languages, cultural values, beliefs, rituals, community laws, and governance systems – has created a diverse array of natural resource management practices that sustain these communities' food security, health, and cultural traditions (Berkes 2008).

Complex forest management practices based on traditional knowledge, including natural forest

management, shifting cultivation, and agroforestry systems, continue to provide the material and non-material needs of societies without jeopardizing the biodiversity and functional integrity of forests and associated ecosystems (Parrotta et al. 2015). Examples of such systems are discussed in the articles included in this short Special Issue of *International Journal of Biodiversity Science, Ecosystem Services & Management (IJBESM)*. Three of the papers included in this Special Issue (Camacho et al. 2016; Bofo et al. 2016; Siahaya et al. 2016) are based on presentations given at the 2014 International Union of Forest Research Organizations (IUFRO) World Congress held in Salt Lake City, USA.

In their assessment of *muyong* – traditional integrated watershed management systems in the northern Philippines – Camacho et al. (2016) discuss how the indigenous people provide the timber and water regulating services to sustain agricultural productivity while also helping to conserve biodiversity and ecosystem resilience for generations, at a landscape level. Similarly, the study by Siahaya et al. (2016) describes the traditional knowledge that has guided the development of upland rice cultivation based on sophisticated shifting cultivation techniques – *gilir balik* – used by the indigenous Dayak Tunjung community in East Borneo, who for generations have relied on these practices to ensure their food security. A study of rural communities in northern Ghana by Bofo et al. (2016) examines how traditional knowledge in its various forms – taboos and totems, customs and rituals, rules and regulations, traditional protected areas – still play an important role in managing ecosystem services in these villages. However, the study also found that awareness of and compliance with traditional norms and practices are associated more with older village residents than with younger generations. This intergenerational erosion of forest-related traditional knowledge, revealed both in this study and in that of the Ifugao communities in the Philippines (Camacho et al. 2016) and among the Dayak Tunjung in East Borneo (Siahaya et al. 2016), highlights the need for greater emphasis on both conservation of traditional knowledge and appropriate adaptation of traditional practices to meet the changing livelihood needs of younger generation without losing the multiple ecosystem service benefits that traditional practices have typically yielded.

There is also significant potential for integrating traditional knowledge into forest resource assessments for the purpose of improved forest management. A good example of the use of traditional knowledge to inform forest management planning is presented by Cummings and Read (2016). Their study demonstrates how traditional knowledge of the Makushi and Wapishiana Amerindians of Southern Guyana may be used as part of forest inventories to identify and classify tree and palm species and how they are used for provisioning, cultural, and supporting ecosystem services. Such an approach enriches our understanding of the multiple dimensions of ecosystem services associated with individual species, and allows for more robust evaluation of forest values than is typically the case in current scientific assessments and management planning activities.

The diversity of traditional forest-related knowledge systems and practices in the world reflects the environmental/ecological conditions, history, and the social, economic, and cultural characteristics of the communities that have retained this knowledge (Parrotta & Trosper 2012). These systems share a number of objectives and characteristics which distinguish them from most 'modern' natural resource management practices, including the following:

- *Sustainability*: Maintaining the land's productive capacity for future generations is a primary goal.
- *Relationships*: Peoples' connections among themselves and to their territory are not severed by the use of new knowledge, ideas, or techniques.
- *Identity*: People maintain their distinct cultural identity.
- *Reciprocity*: People maintain their system of benefit sharing among themselves.
- *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.

These features help to explain how – in the absence of pressures that result in the erosion or destruction of traditional cultural and spiritual values and governance institutions, or loss of connection to their lands – traditional knowledge and practices have survived, evolved, and sustained local and indigenous communities over generations through changing environmental and sociopolitical conditions.

For a variety of reasons, traditional knowledge, forest management practices, and associated governance systems in many regions are being eroded or have disappeared entirely (Collings 2009). Fewer rural households engage in traditional forest

management practices as development programs focus more on the promotion of simplified and intensified agricultural production and other land and resource use that aim at maximizing the yield of a narrow range of agricultural crops and forest products to satisfy the demands of state actors and national or international markets. In the majority of cases, policy-makers, planners, natural resource managers (including conservationists), forestry and agricultural scientists, and extension agents have paid little attention to traditional knowledge and its practitioners. Strenuous efforts have been made to suppress and replace this knowledge with more 'scientific' practices, particularly in the case of shifting agriculture. This erosion and loss of traditional knowledge and practices has often had very serious negative consequences for the well-being of local and indigenous communities, and for forests, associated ecosystems, their biodiversity, and capacity to produce environmental goods and services on a sustainable basis (Ouedraogo et al. 2014).

While traditional forest-related knowledge, its historical contributions, and resilience remain under-recognized, efforts to preserve and enhance it are increasing (Maffi & Woodley 2010). Collaborative research between forest scientists and the holders and users of traditional knowledge – exemplified in the articles included in this Special Issue – is an important component of these efforts. Over the past 10 years, the IUFRO has worked to increase awareness of and interest in traditional knowledge and practices within the forest science community. In 2005, IUFRO established a task force on traditional forest knowledge to bring together scientists from all continents who are approaching traditional knowledge from a variety of natural and social science disciplines, as well as representatives of relevant NGOs and indigenous peoples' organizations.¹ Building on the momentum of the numerous conferences and publications of the task force, two permanent working parties were established within IUFRO in 2010 to foster longer-term international collaboration on forest-related traditional knowledge in tropical and subtropical, and temperate and boreal regions, respectively. This collaboration included the organization of technical sessions which focused on the value of traditional forest-related knowledge for sustainable forest management at the 2014 IUFRO World Congress held in Salt Lake City, USA. Hence, three of the papers included in this Special Issue are a direct result of such technical sessions (Camacho et al. 2016; Boafo et al. 2016; Siahaya et al. 2016).

In spite of the many challenges facing the holders and users of traditional forest-related knowledge throughout the world, there is a growing recognition of, and respect for, the diversity of knowledge systems

and cultural approaches embedded in indigenous and local communities. Increasingly, the value of traditional forest-related knowledge and practices is being recognized in many countries and in international policy forums such as the Convention on Biological Diversity and the UN Convention to Combat Desertification. Most notable is the ongoing work of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). This intergovernmental body, established in 2012, assesses the state of biodiversity and the ecosystem services it provides to society and has as one of its foundational operating principles the recognition and respect for the contribution of indigenous and local knowledge to the conservation and sustainable use of biodiversity and ecosystems (Larigauderie & Mooney 2010; Díaz et al. 2015). In recent years, IPBES has made important progress toward the incorporation of such knowledge in its global and regional assessments (Thaman et al. 2013). The recently completed *Thematic Assessment on Pollinators, Pollination and Food Production* is one such IPBES product in which traditional and local knowledge figured prominently (IPBES 2016).

The studies included in this *IPBESM* Special Issue demonstrate both the value of traditional knowledge for ecosystem management and the challenges that traditional communities face in conserving, fully utilizing, and passing on their knowledge and wisdom to younger generations. Forestry professionals and government decision-makers have important roles to play to reverse the loss of traditional knowledge and enhance the biodiversity conservation and ecosystem service benefits that traditional knowledge-based forest management systems have historically provided. This, however, will require a deeper and more widespread understanding of, as well as respect and support for, the traditional knowledge and practices which are still being retained within local and indigenous communities. Educational institutions, particularly forestry schools and university departments dealing with natural resource management, also have an important role – and opportunity. A fuller appreciation of the value of traditional knowledge for sustainable forest management has the potential to enrich university and professional curricula by expanding current intellectual boundaries to include the knowledge, management practices, and the historical and cultural contexts of the indigenous and local communities which have been marginalized for generations by mainstream science, technology, and education.

Disclosure statement

No potential conflict of interest was reported by the authors.

Note

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

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