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民族植物学与生物多样性的可持续利用

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摘要： 民族植物学是一门研究人与植物相互关系的学科，用于了解世界各地人与植物的相互关系，对于寻找保护植物的最好方法至关重要，这一科学领域在许多国家被应用于有关植物的传统知识调查记载，大量地方性植物区系中的有用植物编目已经完成。在过去一百年中，从民族植物学调查获得的有关植物的地方性知识，对于药物和农业发展，以及植物新产品开发作出了巨大贡献。自从20世纪60年代以来，科学界更为关注全球环境变化的重要性，现代环境变化的速度是人类历史上从来没有过的。自然资源正以惊人的速度消失，威胁到大量物种以至最终灭绝。面对这一危机，民族植物学研究面临的紧迫任务，不仅是作为一种科学工具应对环境的退化，而且由于它的巨大潜力，能为植物资源可持续利用和农村扶贫作出重要贡献。民族植物学研究对现代发展的贡献是多方面的，其中包括：构建传统植物学信息库为保护和发展服务；管理景观系统为保护工作提供各种形式的帮助；加强社区参与农村发展的活力。本文围绕民族植物学在生物多样性保护和现代农村发展中的作用，生物多样性保护和可持续利用面临的挑战，以及生物与文化途径在利用和保护生物多样性中的作用等进行了探讨。

关键词： 民族植物学；生物多样性；传统知识；植物资源；可持续利用与保护
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Ethnobotany and the Sustainable Use of Biodiversity

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Abstract: Ethnobotany, as a scientific discipline, deals with human-plant relationships, and is vitally important to plant conservation. Ethnobotany is used in many countries throughout the world for documenting indigenous knowledge of plants. Consequently, many inventories of useful plants in local floras have been compiled. Over the last hundred years, local knowledge about plants, gained through ethnobotanical studies, has contributed greatly to the development of medicine and agriculture, and to the discovery of numerous new plant-based products. Since the 1960s, the scientific community has become increasingly aware of the magnitude of global environmental change, now occurring at a speed never before encountered in human history. Natural resources are being depleted at an alarming rate and there are threats of imminent extinction to many species. Faced with this crisis, ethnobotanical research assumes a new urgency, not only as a tool for trying to deal with environmental degradation, but also for its potential usefulness in contributing to sustainable use of plant resources and poverty reduction among rural communities. Ethnobotanical research can contribute to modern development in many ways, including: creating information/data-banks of traditional knowledge about plants for use in conservation and future development; managing the landscape so as to best deliver conservation benefits of all types; enhancing rural community engagement in rural development. This paper discusses ethnobotany and its role in modern development and biodiversity conservation, the challenges that biodiversity and sustainable use face, and the biocultural approach of biodiversity use and conservation.

Key words: Ethnobotany; Biodiversity; Traditional knowledge; Plant resources; Sustainable use and conservation

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1 Introduction to Ethnobotany and its role in modern development

The term 'ethnobotany' was first used in a scientific publication by an American botanist, John Harshberger in 1896 (Harshberger, 1896). The context was research he was undertaking into the knowledge and uses of plants by native Americans in the USA (Ford, 1978; Cotton, 1996). From this start, the scope of the subject has expanded to now cover all aspects of human relationship with plants. Many sectors are covered, including how people interact with plants in a wide range of production systems (such as farming, forestry and animal husbandry), the use of plants for various product categories (such as food, fiber, medicine and energy) and the roles of plants in religious and spiritual cultures. Furthermore understanding the human-people relationship around the world is vital to developing best way to conserve plants.

Local knowledge of the uses of plants was a great help to Western countries in the age of European empires as they developed plantation economies in the tropics. Asia, Latin America and Africa all contributed greatly, for example as the sources of tea and teak in Asia, Latin America of cocoa and rubber, and Africa of coffee and oil palm. Genetic resources, discovered and maintained by indigenous societies, have formed the basis of development of many new economic crops. For example, some of the thousands of local landraces of rice, evolved by farmers in Asia over the years, have contributed fundamentally to the development of modern varieties of rice. Knowledge held by local societies has proved a foundation for the development of a very wide range of industrial plant-based products, for example foods, beverages, medicines, cosmetics and others (Xue *et al.*, 2009). According to statistics supplied by Greenpeace, a quarter of the world's annual production of pharmaceutical products (valued at US $ 130 billion) is based on contributions from tropical plants (Prance, 1995; Hamilton and Hamilton, 2006; Pei, 2001).

Over the last two decades, ethnobotany has tended to become more analytical, quantitative, cross-disciplinary and multi-institutional. Ethnobotanists are now much more engaged with sustainable development, conservation, cultural affirmation and the intellectual property rights of local and indigenous people. Ethnobotanical studies have contributed to new ecological insights into the origins and dynamics of tropical ecosystems (Prance, 1995). Today, other countries, apart from Western, are themselves developing new drugs based on ethnobotanical research carried out by their own scientists (Pei, 2001; Jain, 2010). The work of the 'People and Plants Initiative', a programme of UNESCO, WWF and the Royal Botanic Gardens, Kew (1992-2004) and active in the Himalayan region and east Africa as well as other parts of the world, has strongly supported the contention that community participation and traditional knowledge are very important ingredients in efforts to achieve conservation of biodiversity and sustainable use of natural resources (Hamilton and Hamilton, 2006; Pei, 2010).

In the past, ethnobotany has sometimes been considered a 'soft' science, but recent developments in the subject are tending to change this perception. Apart from the intrinsic interest of its findings, ethnobotany is emerging as a subject of great practical value. Its application can lead to a strengthening of cultural diversity and conservation, greater sustainability in the exploitation of plant resources and the development of new plant products. The practical value of ethnobotany in relation to biodiversity can be highlighted in three areas:

1) Creating Information/Data-bank on local knowledge of plants to serve as resources for biodiversity conservation and economic development

The term 'ethnobotanical knowledge' refers to knowledge generated and developed by people over the course of time. One of the main foci of ethnobotanical studies has been recording the knowledge of indigenous people about their plants. Such peoples are generally very knowledgeable about the plants in their neighborhoods, including about their identifica-

tion, classification and ecology. They know much about their properties, for example whether useful as sources of food, medicines and poisons. Plants have symbolic associations and are valued for cultural (including spiritual) reasons. Ethnobotanical knowledge, discovered and passed down through the generations by oral means, has resulted in the ethnobotanical knowledge that we can encounter today (Jain, 2011; Martin, 1996; Pei, 2010, 2002, 1998; Pei *et al.*, 2009)

The rich store of knowledge about plants, as traditionally held by rural communities, is today often being rapidly eroded. Globalization is leading to a more uniform world culturally, with much wisdom gained by our ancestors being lost. Since traditional knowledge about plants can be so useful and since (for certain) only a fraction has so far been recorded, the inventorying and documentation of ethnobotanical knowledge remain an urgent need (Hamilton and Hamilton, 2006; Pei and Huai, 2007). I comment the use of digitized databases to store ethnobotanical information. Not only are such systems efficient as information stores, they also facilitate the evaluation of this information for practical purposes, for example according to where particular knowledge of plants is held (particular communities or places) or according to categories of plant use (e. g. plants used for food, medicine, energy production, fodder, as colourants, etc).

2) Roles of ethnobotany in biodiversity conservation

Traditional knowledge is important in maintaining biodiversity. The term 'plant genetic resources' refers to genetically determined traits in useful plants that can be identified, characterized, evaluated and exploited by people to meet their needs. These resources should not simply be regarded as types of plants having unique stretches of DNA, but also as expressions of people's cultures. Well known plant genetic resources include Jasmine Rice in Thailand, Basmati Rice in India and Long-stem Rice in Myanmar. Chinese examples include Cultivated Ginseng (*Panax ginseng*) and Gou-ji Berry (*Lycium chinense*) (CBD, 1992; Prance, 1995; Xue *et al.*, 2009; McNeely, 2009; Hamilton and Hamilton, 2006).

Over the last half century, the rapid acceleration of globalization has resulted in the disappearance of many traditional varieties of crops. For instance, in Xishuangbanna, a tropical prefecture in Yunnan, China, some 800 varieties of paddy rice and 400 varieties of upland rice were planted in farmers' fields during the 1970's (Pei, 1998, 2002). Today, nearly all of these have disappeared, thanks to their displacement by high yielding modern varieties and the large scale abandonment of shifting agriculture. Maintaining plant genetic resources among forest plants is another big issue in biodiversity conservation. Land-use change, including deforestation, and the over-harvesting of forest plants are the main factors causing loss. Traditionally, people living in forest areas have had a high dependency on forest resources for their livelihoods, so that the decline in these resources can have the potential to threaten their survival (Pei, 1998). Ethnobotanical research can contribute to conservation and sustainable development in this context, including where there are protected areas. It can help in the understanding of the values, knowledge and uses of forest plants by local people. It can point to new ways of managing forest resources, as appropriate to modern economic pressures, as well as local societies and cultures.

Ethnobotanical studies can be undertaken narrowly, concentrating only on certain specific interactions of people with plants, or they can be carried out with reference to a wider picture. Plants (individually or collectively as vegetation) can offer a wide range of benefits to people (Hamilton and Hamilton, 2006; Jain, 2011; Prance, 1995; Pei and Huai, 2007; Pei, 2010, 1995; Jansen *et al.*, 1991). While scientists interested in conservation have generally paid attention especially to species' survival and sustainable use, plants also contribute to conservation through their roles in delivering ecosystem services. The types of plants and vegetation

present in a neighborhood can have a big influence on the local climate, the delivery of water supplies, and the availability of pollinating insects (Hamilton and Hamilton, 2006; Pei *et al.*, 2009). Using ethnobotany to find out how local people perceive ecosystem services can be a fruitful field of research.

3) Roles of ethnobotany in rural community development

Compared to many other scientific fields, the scope for research in ethnobotany is very wide, with unusually strong foci on field work, people-centered issues and problem-solving. The work generally involves frequent discussions with community members, including local experts on plants, para-taxonomists and bare-foot doctors, as well as other informants (Cotton, 1996; Martin, 1995; Pei and Huai, 2007).

From the perspective of the sustainable development, ethnobotanists can be especially interested in community practices that result in the sustainable use of plant resources, local methods for maintaining genetic resources, traditional practices that promote the conservation of forests, and the roles of local spiritual beliefs and practices in traditional conservation (Pei *et al.*, 2010, 2009, 2001, 1998, 1995, 1993). Ethnobotanical studies can identify new technologies that are ecologically and culturally appropriate.

Many stakeholders can be involved in the exploitation of biodiversity-producers, harvesters, middlemen, traders, processors, consumers and policy makers. How the benefits from such exploitation are distributed among the various stakeholders can have important implications for success in achieving conservation, as well as for social justice. Ethnobotanists can be in a good position to help achieve satisfactory arrangements, working with different stakeholders and following certain principles on benefit-sharing developed internationally (Hamilton and Hamilton, 2006; Pei *et al.*, 2010, 2007).

2 Challenges to sustainable use of biodiversity and conservation

Throughout the world, biodiversity is reduced diminishing, as shown, for example, by the large number of species facing extinction and the rapid loss or degradation of many natural ecosystems. As many as 34 000 species of plants have been recorded as globally threatened (about 10% of the total, IUCN 1997). The figure for China is 4 400 out of a total of 34 000 species (12.9%) (Raven, 2011).

The global biodiversity crisis is potentially catastrophic, since human life depends on plants and animals not only for its day-by-day survival (for food, medicine, industrial materials etc), but for maintenance of the ecosystem which people inhabit. The biological world nurtures us in every way. Biodiversity is our life support system.

Over recent years, many developing countries have placed great reliance on their biodiversity wealth in the development of their economies. China has made extensive use of their biological (and cultural) diversity to develop their tourist industries (both internal and external). China has developed vast pharmaceutical and herbal industries based on medicinal and aromatic plants (Pei, 2001, 1998). But these successes in exploiting biodiversity should not make us complacent. The world is teetering on an environmental precipice. Much greater challenges lie ahead, fueled by the demands for resources and pollution produced by a rapidly expanding (and already vast) human population and climate change. It has been projected that the world's population could reach 22.5 billion by the year 2050 and that average temperatures in China will rise by 1.3 ℃-2.1 ℃ by 2020 and 2.3 ℃-3.3 ℃ by 2050 (Raven, 2011; McNeely, 2009).

Peter Raven, the eminent American botanist and conservationist, has recently pointed out (2011) that the collective pressure placed by our numbers and our activities on the global environment has reached a "frightening and rapidly increasing level" of unsustainability. He estimates that more than half of all species in the world will become extinct during the 21st century. According to a website (globalfootprint.org), current use of natural resources exceeds the

long-term capacity of the world to sustain production of these resources by 150%. We are living off environmental capital. Future generations are bound to suffer. Inevitably, they will inhabit a world with a narrower base of natural resources than we have today and which is culturally and biologically less diverse. It is likely that the scourge of poverty will grow. Even today, a billion people worldwide are malnourished and another 100 million live on the verge of starvation (Raven, 2011).

3 Biocultural approaches to sustainable use and conservation of biodiversity

Sustainable use and conservation of biodiversity are central challenges of economic development today. We know that the tropics hold the largest portion of the world's biodiversity (over 50% of species). For instance, Southeast Asia holds the second largest area of tropical rain forest in the world and a very large number of economically important species of plants (Jasen *et al.*, 1991). As many as 1 556 species of medicinal plants have been recorded from Thailand, as well as 1 000 species of orchids (Kanchit, 2006). China, which is a very large country reaching into the tropics, contains 35 337 species of plants and 8 804 species of animals (2008 figures) (Pei, 2010). Biodiversity in our region is exceptional, not only for its great richness in terms of numbers of species and types of habitat, but also because of the roles it plays in local cultures and economies. Many types of plants have known uses. According to Jasen *et al.* (1991), 6 186 species of economically important plants in some 40 commodity groups have been recorded in Southeast Asia.

For example, Thailand and China are multi-nationality countries, with a diversity of ethnic groups, each often associated with a particular habitat. Each cultural group has its own knowledge and traditions relating to its plants. Each has traditional ways of maintaining local plant resources and plant diversity. The rich ethnobotanical knowledge of these diverse ethnic groups is an expression of long periods of interaction between people and plants. It is a resource that urgently needs to be further studied, inventoried and properly recorded.

Cultural and biological diversity are intimately and inextricably linked (McNeely, 2009). Through many years of ethnobotanical studies in China, I have come to the conclusion that there is a co-evolutionary relationship between biological and cultural diversity; there are mutual independencies (Pei, 1995, 1998, 2002, 2010). The roots of appreciation of the value of biodiversity run very deep in many traditional worldviews, connected to spiritual understandings and religions (McNeely, 2009). Recent ethnobotanical studies have revealed that traditional beliefs related to religion are powerful forces promoting environmental preservation, including conservation of biodiversity. Examples of which I have direct experience are the Holy Hill Sacred Natural Sites of the Dai people in Xishuangbannan and the Sacred Mountains in Tibetan area of Yunnan (Pei, 1993). Nearly twenty years ago, the *Convention on Biological Diversity* (adopted at the Earth Summit in Rio de Janeiro in 1992) acknowledged the usefulness of encouraging use of biological resources following traditional practices, given that they are often compatible with the conservation of biological diversity (Article 10; CBD).

Natural ecosystems cannot be understood, managed and conserved without recognizing the cultural influences that have shaped and still influence them. Cultural diversity linked to biological diversity holds the key for ensuring resilience in both social and ecological systems (Lee and Schaaf, 2003). Research methods associated with ethobotany can be powerful tools for working out how best cultural and biological diversity can be associated to meet the challenges of today. From my experience, I suggest the following initial suggestions about ways to forge biocultural connections:

1) Recognize the values of traditional knowledge and related practices for finding ways to improve the management of natural resources and maintain biodiversity. Be aware that approaches to development

based solely on modern science and technologies have far too often neglected traditional knowledges.

2) Conduct ethnobotanical inventories as entry-points for finding ways to improve the management of natural resources for sustainable development and conservation. Enter the data collected in digitized information systems to ensure that this information survives and remains available to assist development in the future.

3) Integrate traditional and scientific knowledge in evaluating the use and management of plant resources, and for developing of new products.

4) Promote community participation in the management of biodiversity for conservation and sustainable use. Among the key issues are the establishment or development of suitable community institutions, the development of sustainable harvesting systems, and fair benefit-sharing from the exploitation of biodiversity.

5) Try to understand all the ways in which local people perceive the values of local plant diversity, including for the provision of ecosystem services. Be aware of the power of spiritual and religious values for determining how people relate to their environments.

6) Empower community groups and local governmental institutions to appreciate the biocultural approach to conservation and development. Evaluate the impact of higher level policies on local institutions and, where necessary, try to influence policy reform to better support the efforts of people working at the local level.

References:

CBD, 1992. Convention on Biological Diversity [R]. United Nations

Cotton CM, 1996. Ethnobotany: Principles and Applications [M]. John Wiley & Sons: Chichester

Ford RI, 1978. Historical Diversity and Synthesis//Ford R. I., The nature and status of ethnobotnay: Anthropological papers [R]. No. 67, Ann Arbor: Museum of Anthopology, University of Michigan

Hamilton A, Hamilton P, 2006. Plant conservation [J]. *Earthscan*

Harshberger JW, 1896. *The Purposes of Ethnobotany, The Botanical Gazette Volume XXI* [M]. New York and London: University of Chicago Press, Johnson Reprint Corporation

Jain SK, 2011. Ethnobotany in India: Some Thoughts on Future Work [J]. *Ethnobotany*, Vol. 22, 1—4

Jansen PCM, Lemmens RHMJ, Oyen LPA *et al*. eds, 1991. *Plant Resources of South East Asia: Basic List of Species and Commodity Grouping*, version 1 [M]. Wageningen, The Netherlands: Pudos

Kanchit T, 2006. Orchids in Thailand [Z]

Lee C, Schaaf T eds., 2003. Proceedings of an International Workshop on the Importance of Sacred Natural Sites for Biodiversity Conservation [C]. Paris, France: UNESCO

Martin, Gary J, 1996. *Ethnobotany: A Mehtods Manual* [M]. London: Chapman & Hall

McNeely JA, Mainka SA, 2009. Conservation for a New Era [R]. IUCN

Pei SJ, 1993. Managing for Biodiversity Conservation in the Temple Yards and Holy Hills: The Traditional Practices of the Xishuangbanna Dai Community, Southwest China [A]. In: Lawrence SH, Takeuchi HF (eds.), *Ethics, Religion and Biodiversity* [M]. Cambridge: The White Horse Press, UK

Pei SJ, 1995. Mountain Culture and Forest Resource Management of Himalaya [A]. In: Tewari DN (ed.), *Himalayan Ecosystem* [M]. Intel Book Distribution. Dehra Dun, India

Pei SJ, 1998. Biodiversity Conservation in the mountain development of Hindu Kush-Himalayas [A]. In: Chou CH, Shao KT (eds.), *Frontiers in Biology: The Challenge of Biodiversity, Biotechnology and Sustainable Agriculture* [M]. Taipei: Academic Sinica

Pei SJ, 2001. Ethnobotanical approach of traditional medicine studies: some experiences from Asia [J]. *Pharmaceutical Biology*. Vol. 39. Supplement 74—79

Pei SJ, 2002. Bio-culture diversity and development of west China [J]. *Journal of the Graduate School of Chinese Academy of Sciences* (**中国科学院研究生院学报**), **19** (2): 107—115

Pei SJ, Huai HY, 2007. *Ethnobotany* [M]. Shanghai: Shanghai Science and Technology Press

Pei SJ, Zhang GX, Huai HY, 2009. Application of traditional knowledge in forest management: ethnobotanical indicators of sustainable forest use [J]. *Forest Ecology and Management*, **257**: 2017—2021

Pei SJ, Hamilton A, Yang LX *et al*., 2010. Conservation and development through medical plants: A case study from Ludian (Northwest Yunnan, China) and presentation of a general model [J]. *Biodiversity Conservation*, **19**: 2619—2636

Pei SJ, 2011. Traditional culture and biodiversity [J]. *Bulletin of the Chinese Academy of Sciences*, **26** (2): 190—196

Prance GT, 1995. Ethnobotany and in the future [A]. In: Schultes RE, Peis S von, *Ethnobotany: Evolution of a Discipline* [M]. London: Chpman and Hall, 60—68

Raven PH, 2011. Plant conservation in the future: new challenge, new opportunities [J]. *Plant Diversity and Resources* (**植物分类与资源学报**), **33** (1): 1—9

Xue DY, Cui GB, Cai L *et al*., 2009. *Genetic Resources, Traditional Knowledge and Intellectual Property* [M]. Beijing: China Environmental Science Press