Concepts and Protection of Traditional Knowledge in Agricultural Heritage Systems: The Case of Pu' er Ancient Tea Gardens and Tea Culture System (Postprint)

Authors: Ma Nan; Min Qingwen; Yuan Zheng

Date: 2018-01-05T00:00:00+00:00

Abstract

Traditional knowledge represents not only the empirical wisdom accumulated by residents within local communities through long-term adaptation to the natural environment, but also constitutes a structural element of agricultural heritage systems, exerting a supportive function within these systems. Consequently, the inheritance and protection of traditional knowledge represents a crucial component of agricultural heritage conservation initiatives. This study, through an inductive analysis of definitions and connotations of traditional knowledge within existing relevant international conventions and scholarly research, and in conjunction with the distinctive characteristics of agricultural heritage, defines traditional knowledge in agricultural heritage contexts as "the knowledge, innovations, and practices accumulated by residents within agricultural heritage systems throughout long-term production and livelihood processes, centered on agriculture and intimately connected to multiple dimensions including livelihood sustenance, resource management, biodiversity conservation, and the maintenance of spiritual beliefs." Such knowledge can be classified into five categories: livelihood-sustenance traditional knowledge, biodiversity conservation traditional knowledge, traditional technical knowledge, cultural traditional knowledge, and natural resource management traditional knowledge. The article systematically examines the interrelationship between agricultural heritage and traditional knowledge, employing the Pu' er Ancient Tea Garden and Tea Culture System as a case study. Drawing upon actual conditions at the heritage site, it identifies pressing challenges in contemporary traditional knowledge protection, including damage to physical carriers, crises in intergenerational transmission, impacts from tourism development, and relatively ineffective protection measures. Accordingly, the study proposes several recommendations: enhancing protection awareness, integrating traditional knowledge conservation into

comprehensive heritage system protection planning, conducting systematic surveys and cataloging of traditional knowledge, strengthening documentation of transmission processes, and fully leveraging existing institutional mechanisms for traditional knowledge protection. These measures aim to provide reference points for the protection of traditional knowledge within agricultural heritage systems.

Full Text

The Concept and Protection of Traditional Knowledge in Agricultural Heritage Systems: A Case Study of Pu' er Traditional Tea Agrosystem

MA Nan[1,2], **MIN Qingwen**[1], **YUAN Zheng**[3]
[1]Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, Beijing 100101, China
[2]University of Chinese Academy of Sciences, Beijing 100049, China
[3]Beijing Development Center of Popular Science, Beijing 100101, China

Abstract

Traditional knowledge represents not only the accumulated experiential wisdom of local communities through long-term adaptation to their natural environment, but also constitutes a structural element of agricultural heritage systems. As such, the inheritance and protection of traditional knowledge constitutes a crucial component of agricultural heritage conservation efforts. This paper synthesizes and analyzes existing definitions and connotations of traditional knowledge in relevant international conventions and research literature. Drawing upon the distinctive characteristics of agricultural heritage systems, we define traditional knowledge within these systems as "the knowledge, innovations, and practices accumulated by residents through long-term agricultural production and daily life, closely related to livelihood maintenance, resource management, biodiversity conservation, spiritual beliefs, and other aspects." This knowledge can be categorized into five types: livelihood maintenance traditional knowledge, biodiversity conservation traditional knowledge, traditional skills knowledge, cultural traditional knowledge, and natural resource management traditional knowledge. By examining the relationship between agricultural heritage and traditional knowledge, and using the Pu'er Traditional Tea Agrosystem as a case study, this paper identifies key challenges in current protection efforts, including destruction of physical carriers, crises in knowledge transmission, negative tourism impacts, and relatively ineffective protection measures. We propose strengthening protection awareness, integrating traditional knowledge conservation into heritage system planning, conducting systematic surveys and cataloging, enhancing documentation of inheritance processes, and fully utilizing existing institutional frameworks to protect traditional knowledge. These recommendations aim to provide guidance for the conservation of traditional knowledge within agricul-

tural heritage systems.

Keywords: Traditional knowledge; Traditional knowledge protection; Agricultural heritage system; Pu' er Traditional Tea Agrosystem

1. The Concept and Connotation of Traditional Knowledge

Traditional knowledge encompasses multiple domains including ethnicity, ecology, culture, society, and economy, making it a comprehensive research topic. Currently, there is no unified definition, and scholars from different fields hold varying understandings and definitions of traditional knowledge.

1.1 Traditional Knowledge in Relevant International Conventions

Several international organizations and conventions have defined traditional knowledge, including the World Intellectual Property Organization (WIPO), the World Trade Organization (WTO), and the Convention on Biological Diversity (CBD).

WIPO conceptualizes traditional knowledge as "a living body of knowledge that is transmitted within communities from generation to generation and forms part of a people' s cultural or spiritual identity." This knowledge typically undergoes processes of generation, preservation, and circulation, characterized by its traditional and intergenerational nature. It maintains significant connections with the communities and residents who preserve and transmit it, forming an integral component of the cultural identity of indigenous communities and individuals who hold such knowledge. WIPO operates with two levels of definition: broadly, traditional knowledge encompasses knowledge systems and practices of traditional communities such as indigenous and local communities, including both the knowledge itself and associated cultural expressions like unique symbols and signs. Narrowly defined, traditional knowledge refers to knowledge, skills, practices, and innovations within traditional contexts, typically including agricultural knowledge, scientific knowledge, ecological knowledge, medicinal knowledge (including pharmaceuticals and treatment methods), and biodiversity-related knowledge. Thus, WIPO's definition is relatively broad, extending beyond knowledge itself to include practices and innovations, while emphasizing the dynamic and cultural dimensions of traditional knowledge.

Under the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), the WTO has conducted numerous discussions concerning genetic resources and traditional knowledge. Article 27 of TRIPS primarily addresses whether biological materials can be patented and whether patent applications must disclose the origin of genetic resources and traditional knowledge and related benefit-sharing arrangements, focusing on the disclosure of sources during patent applications. In WTO definitions, traditional knowledge primarily refers

to knowledge related to biological and genetic resources, with cultural and artistic categories of traditional knowledge falling outside its main scope.

The CBD defines traditional knowledge as knowledge, innovations, and practices developed through long-term experience within indigenous and local communities, adapted to local culture and environment, typically transmitted orally across generations, and collectively owned. Its manifestations include stories, songs, proverbs, beliefs, rituals, cultural values, local customary laws, and indigenous languages. In this definition, traditional knowledge is practical, encompassing knowledge in agriculture, fisheries, horticulture, forestry, medicine, and environmental management. The CBD preamble states that it "recognizes the close and traditional dependence of many indigenous and local communities embodying traditional lifestyles on biological resources, and the desirability of sharing equitably benefits arising from the use and conservation of biological resources and the sustainable use of their components, including related traditional knowledge, innovations, and practices." This indicates that the CBD considers traditional knowledge primarily related to biological resources, particularly concerning the utilization and conservation of biological resources. Furthermore, the CBD links traditional knowledge with indigenous and local communities, recognizing their close and traditional interdependence.

Among these international conventions, the CBD and WTO definitions focus primarily on traditional knowledge related to biological resources, with the WTO emphasizing genetic resources within biological resources and thus being more targeted. WIPO' s definition, by contrast, is more comprehensive.

1.2 Traditional Knowledge in Relevant Research

Although international conventions have provided descriptions of traditional knowledge, a unified definition remains elusive, and the concept continues to be a focus of extensive scholarly research and discussion. Due to the complexity of traditional knowledge, numerous experts and scholars have developed conceptual definitions and connotations based on their specific research contexts.

Xue Dayuan, integrating existing definitions with the practical characteristics of biological resources, categorized biological resource-related traditional knowledge into five types: traditional knowledge of agricultural biological and genetic resource utilization, traditional knowledge of medicinal biological resource utilization, traditional technological innovations and production lifestyles related to biological resource use, traditional culture and customs related to biological resource conservation and utilization, and traditional geographical indication products.

Swiderska defined traditional knowledge from the perspectives of holders and values as "knowledge, innovations, and practices closely related to traditional resources, territories, local economies, genetic, species, and ecosystem diversity, cultural and spiritual values, and customary law," with holders generally being indigenous or local communities.

Yin Lun, incorporating anthropological perspectives, defined traditional knowledge based on its dialectical, dynamic, and interactive characteristics, arguing that traditional knowledge maintains vitality and practicality through continuous inheritance and innovation. It represents people' s understanding of the world and serves as a means for their sustained survival. Traditional knowledge can generally be divided into traditional community mechanisms and organizations, local experts and their mastery of traditional medicinal knowledge, livelihood practices, and related biological resource knowledge, and objective conservation, understanding, and practices regarding natural resources under these subjective factors.

These definitions demonstrate that regardless of perspective, the primary characteristic of traditional knowledge is its traditional nature—that is, accumulation and transmission over time. Simultaneously, it is inseparable from local people' s practical lives, helping them maintain livelihoods, understand the world, live harmoniously with the natural environment, and sustain spiritual beliefs, thus holding significant importance. Traditional knowledge continuously updates and improves itself over time, exhibiting vigorous vitality.

1.3 Traditional Knowledge in the Context of Agricultural Heritage Systems

Agricultural heritage systems themselves have broad and narrow definitions. Narrowly defined, agricultural heritage systems refer to heritage sites that meet the FAO' s five criteria: food and livelihood security; biodiversity and ecosystem functions; knowledge systems and farmers' technologies; social organizations and culture; and landscape and land-water resource management. Broadly defined, agricultural heritage systems encompass any systems with agricultural heritage value, not necessarily strictly adhering to all five criteria. In this context, this paper defines traditional knowledge in agricultural heritage systems as "the knowledge, innovations, and practices accumulated by residents within agricultural heritage systems through long-term production and daily life, closely related to livelihood maintenance, resource management, biodiversity conservation, spiritual beliefs, and other aspects." This knowledge can be divided into five categories corresponding to the five criteria of the narrow FAO definition: livelihood maintenance traditional knowledge, biodiversity conservation traditional knowledge, traditional skills knowledge, cultural traditional knowledge, and natural resource management traditional knowledge.

Livelihood maintenance traditional knowledge refers to knowledge related to biological resource identification and utilization that sustains residents' livelihoods within agricultural heritage systems, such as traditional knowledge of using biological resources for dyeing.

Biodiversity conservation traditional knowledge refers to knowledge developed by residents through adaptation to ecological environments to ensure sustainable use of biological resources or driven by cultural and spiritual beliefs,

including knowledge for protecting ecosystems and their biodiversity, such as the traditional practice of "harvesting large individuals while leaving small ones" when collecting biological resources.

Traditional skills knowledge refers to traditional technical knowledge related to agricultural production accumulated by residents, such as traditional pest control techniques.

Cultural traditional knowledge refers to culture-related traditional knowledge derived from agricultural activities, culture, and religious beliefs, such as traditional cultural knowledge about conducting sacrificial ceremonies during agricultural activities to pray for bountiful harvests.

Natural resource management traditional knowledge refers to knowledge accumulated by residents for more effective utilization of water, soil, and biological resources, including traditional knowledge of water-soil resource management and landscape management, such as intercropping different crops.

2. The Relationship Between Traditional Knowledge and Agricultural Heritage Systems

2.1 Traditional Knowledge as an Important Component of Agricultural Heritage Systems

According to the GIAHS selection criteria, traditional knowledge is one of the five fundamental characteristics and constitutes a structural element of agricultural heritage systems. In the Pu' er system, for example, there are over 200 pieces of traditional knowledge across all five categories .

Traditional knowledge permeates all aspects of local residents' lives, sustaining their daily existence. In the Pu' er system, the organic combination of natural resource management traditional knowledge with the region' s superior natural conditions has nurtured the unique natural landscape of Pu' er' s ancient tea gardens. Furthermore, the integration of various traditional knowledge systems with the rich ethnic cultures of diverse nationalities has created unique traditional technologies and water-soil resource management methods. This organic combination of conditions constitutes the profound connotation of the Pu' er Traditional Tea Agrosystem, which has consequently been designated as a GIAHS site.

2.2 Positive Impacts of Traditional Knowledge on Agricultural Heritage Systems

Traditional knowledge is not only an important component of agricultural heritage systems that constitutes their unique value, but also exerts positive influences on these systems in multiple aspects, including maintaining their continuity, enriching cultural values, and protecting ecological environments. Using the Pu' er system as an example:

The diverse traditional knowledge within the system sustains local residents' livelihoods. For instance, biological resource utilization knowledge helps residents utilize various biological resources to obtain essential food, medicine, and other biological products, while biological resource identification knowledge prevents exposure to toxic resources. Moreover, proper application of natural resource management and traditional skills knowledge enables sustainable cycling of agricultural production systems. Additionally, the self-renewing nature of traditional knowledge ensures its continuous updating and improvement over time, while also helping the Pu' er system remain a living, dynamic system. Consequently, the ancient Pu' er system has adapted to contemporary contexts by absorbing traditional essence and discarding outdated elements, demonstrating its unique cultural and practical value.

Traditional knowledge emerges from the interplay of local traditional culture and unique ethnic cultures, possessing profound cultural connotations and forming an important component of traditional agricultural culture within the Pu' er system, thereby enriching its cultural value. For example, the traditional knowledge of worshipping "tea god trees" among ethnic groups such as the Bulang and Deang peoples involves not only the utilization of biological resources like glutinous rice but also reflects spiritual beliefs that these trees can bless tea gardens with bountiful harvests. Similarly, the customary law management of tea gardens and forests among the Lisu people demonstrates not only unique farmland management methods but also highlights the ecological spirit of harmonious coexistence between humans and nature in Lisu culture.

Through adaptation to the natural environment, residents of the Pu' er system have accumulated extensive biodiversity conservation traditional knowledge to ensure sustainable resource utilization. For instance, when collecting bamboo shoots, the Dai people consciously leave healthy shoots at intervals to ensure population sustainability. The Wa people practice several intercropping patterns, such as tea trees with upland rice, upland rice with eucalyptus, and coffee with melons, which not only effectively prevent pest outbreaks on sloping farmland but also protect species and genetic diversity. Thus, traditional knowledge protects biodiversity and ecosystem integrity within the Pu'er system, maintains its vitality, and ensures the sustainability of agricultural heritage.

3. Major Problems in Traditional Knowledge Protection

Traditional knowledge in agricultural heritage systems plays a crucial role, serving as both a structural component that constitutes unique value and a positive force that maintains sustainable operation, enriches cultural connotations, protects ecological environments, and ensures system vitality. However, like other types of traditional knowledge, it faces tremendous crises amid rapid socioeconomic development, with protection efforts encountering a series of problems.

3.1 Destruction of Traditional Knowledge Carriers

Most traditional knowledge in agricultural heritage systems relies on physical carriers. In the Pu' er system, for example, biological resource utilization traditional knowledge depends on corresponding biological resources—if these resources are lost, the associated knowledge gradually disappears. However, due to geographical conditions and historical factors, residents' economic income remains relatively low. Over the past 50 years, driven by economic benefits, population growth, and widespread market attention to ancient tree tea, some local tea farmers have engaged in destructive practices. Lacking awareness of traditional knowledge protection and long-term vision, they have destroyed tea plantations to grow grain, felled wild ancient tea trees, conducted destructive harvesting of ancient tea garden leaves, and replaced ancient tea gardens with monoculture plantations, resulting in substantial reduction of ancient tea garden area within the system. Under these circumstances, traditional knowledge dependent on ancient tea gardens, such as ancient tea garden management and crop planting knowledge, faces significant protection challenges.

Furthermore, the absence of related education and publicity has led to unclear understanding and weak protection awareness among Pu' er system residents regarding traditional knowledge. Driven by economic incentives, two inappropriate management situations have emerged in some ancient tea gardens. In some gardens, such as the Jingmai ancient tea garden, excessive management has occurred, with traditional practices like "cutting grass with knives"gradually evolving into modern management methods. In other severely damaged gardens, strict control measures by management authorities have prevented implementation of traditional practices like pruning and disease branch removal. In both cases, although ancient tea trees remain, the associated traditional knowledge has lost opportunities for application and faces disappearance.

3.2 Crisis in Traditional Knowledge Transmission

Much traditional knowledge in agricultural heritage systems like the Pu' er system is unique knowledge formed through adaptation to the natural environment under the influence of natural, cultural, and historical factors to improve residents' lives. However, under current social conditions, traditional knowledge transmission faces several problems. First, much traditional knowledge is held by elderly individuals or specialized practitioners such as herbalists. Due to work and study needs, most young people in heritage systems work or study elsewhere, having limited exposure to traditional knowledge. As older generations pass away and specialized professions disappear, related traditional knowledge is lost due to lack of inheritors. Second, traditional knowledge regarding farming and tea garden management in the Pu' er system relies on manual operations. While ensuring high product quality, this approach yields relatively low output, creating contradictions with improving residents' living standards. Consequently, some areas have abandoned traditional production methods, creating difficulties for knowledge transmission. For example, residents traditionally practiced

extensive management of ancient tea gardens. However, with increased market attention to ancient tree tea, some tea farmers have shifted to modern management methods to boost yields. This not only threatens traditional knowledge with disappearance due to reduced use but also prevents workers and visitors in these gardens from accessing such knowledge.

3.3 Tourism Impacts on Traditional Knowledge

Agricultural heritage tourism can drive development, increase residents' economic income, raise public awareness of heritage systems, and help more people understand agricultural heritage, making it an important initiative for development and visibility expansion. However, rapid development of tourist areas such as the Lancang Huimin Jingmai Mangjing Tourism Zone and Qianjiashan Tourism Zone in the Pu' er system has created difficulties for traditional knowledge protection. For instance, traditional knowledge like ancient tea garden management methods is often considered public domain knowledge held collectively by all or specific residents of the Pu' er system. During cultural tourism, this knowledge is frequently displayed to visitors to enhance their interest and understanding. Once such knowledge becomes publicly known, it is considered to have entered the public domain and no longer qualifies for protection under current intellectual property and patent law frameworks, facing risks of imitation and misappropriation. Additionally, large influxes of tourists create significant shocks between external cultures and the traditional culture and knowledge within the Pu' er system, posing major crises for transmission and protection.

3.4 Lack of Effective Protection Measures

Although numerous experts and scholars have researched "traditional knowledge protection," specialized studies on protecting traditional knowledge within agricultural heritage systems remain limited. While theoretical research has achieved certain results, practical implementation of protection measures continues to face difficulties. In the Pu' er system, traditional knowledge protection currently confronts several challenges. First, although traditional knowledge serves as a major criterion for heritage designation and constitutes an important system component, dynamic protection efforts still primarily focus on tangible elements such as natural landscapes, agricultural species, and traditional species habitats. Existing protection regulations in the Pu' er system, such as the "Yunnan Province Lancang Lahu Autonomous County Ancient Tea Tree Protection Regulations" and "Lancang Lahu Autonomous County Jingmai Mangjing Ancient Tea Garden Scenic Area Management Interim Provisions," mainly protect specific objects like ancient tea trees and gardens, with traditional knowledge protection remaining inadequate. Second, current intellectual property protection systems for copyright, patent, and trademark rights, along with benefit-sharing mechanisms, have been implemented relatively recently and remain imperfect, creating deficiencies in effectively protecting traditional knowledge such as tea songs and tea dances in the Pu' er system.

4. Recommendations for Traditional Knowledge Protection

4.1 Enhancing Traditional Knowledge Protection Awareness

First, traditional knowledge protection education should be incorporated into agricultural heritage system-related activities in the Pu' er system to enhance heritage workers' understanding of the importance and urgency of traditional knowledge protection, linking knowledge protection with agricultural heritage conservation at the conceptual level. Second, education campaigns should target heritage system residents to help them recognize that their traditional knowledge constitutes an important component of ethnic culture, traditional culture, and heritage systems with outstanding value, thereby strengthening their self-identification with traditional knowledge and deepening their sense of responsibility and initiative for its protection. This approach would enhance awareness among all stakeholders regarding traditional knowledge protection in heritage systems like Pu' er.

Simultaneously, greater attention should be paid to protecting and developing agricultural heritage systems like Pu'er. Only by ensuring the healthy operation of the heritage system itself can traditional knowledge find support, continue through use, and continuously update and improve alongside the heritage system to meet contemporary needs.

4.2 Integrating Traditional Knowledge Protection into Heritage System Conservation Planning

Heritage managers should incorporate traditional knowledge protection into heritage system evaluation and application criteria. For designated agricultural heritage sites like the Pu' er system, dynamic protection planning adjustments should require integration of traditional knowledge protection. For areas applying for agricultural heritage designation, traditional knowledge protection should be required in their dynamic conservation plans. Furthermore, traditional knowledge protection status should be included as an indicator in regular evaluations of agricultural heritage systems to urge management personnel to protect traditional knowledge, truly making it an integral part of agricultural heritage conservation.

4.3 Conducting Traditional Knowledge Survey, Collation, and Cataloging

Understanding the quantity and status of traditional knowledge in agricultural heritage systems is a prerequisite for its protection. We recommend that heritage managers collaborate with staff in heritage systems like Pu' er to conduct surveys, establish knowledge databases, and identify knowledge holders. For traditional medicinal knowledge, records should include used biological resources, specific dosages, application methods, treated conditions, ethnic groups, and historical usage. For traditional knowledge of edible biological resource utilization, documentation should cover resource varieties, biological characteristics,

origins, current status, edible parts, preparation methods, occasions, historical usage, and underlying cultural connotations. For biological resource identification knowledge, records should include specific species, identification rationales, and usage history. For agricultural planting, farmland management, and water-soil resource management knowledge, documentation should encompass specific content, applicable conditions, usage history, ethnic groups, and cultural connotations. Other traditional knowledge should be recorded according to its content, including user groups, usage history, applicable conditions, and cultural connotations.

Concurrently with survey and cataloging efforts, we recommend assessing and grading the endangerment status of traditional knowledge based on actual conditions, with regular updates during heritage system evaluations to monitor endangerment status in real time and enable timely targeted measures.

4.4 Strengthening Traditional Knowledge Transmission

Addressing the transmission crisis facing traditional knowledge in agricultural heritage systems, we recommend that management personnel consciously promote traditional knowledge among young local residents while conducting surveys and documentation. In the Pu' er system, for example, we suggest establishing traditional knowledge learning classes during school holidays to increase youth understanding of local traditional knowledge and cultivate their sense of responsibility for its protection and transmission. For traditional knowledge facing severe disappearance crises, we recommend consciously training inheritors during survey and documentation processes.

For traditional professions like herbalists who hold substantial medicinal traditional knowledge but face disappearance crises, we recommend selecting specialized personnel from local medical systems to learn and inherit relevant traditional medicinal knowledge. After targeted theoretical summarization and technical improvement of particularly effective and valuable medicinal knowledge, it should be applied in medical practice, enabling not only knowledge transmission but also promotion under current technical conditions.

4.5 Utilizing Existing Systems to Protect Traditional Knowledge

Protecting traditional knowledge in agricultural heritage systems requires leveraging existing laws, regulations, and programs related to patents, geographical indication products, and China' s Important Agricultural Heritage Systems. Using the Pu' er system as an example, on one hand, heritage staff should actively apply for patents, geographical indication product status, and intangible cultural heritage designation for internal traditional knowledge using these existing protection systems to achieve protection and benefit-sharing. On the other hand, we recommend using the agricultural heritage platform to treat traditional knowledge in the Pu' er system as an inseparable important component, listing traditional knowledge protection as a key priority in heritage system de-

velopment and conservation planning, and utilizing project funds and personnel for protection efforts.

5. Conclusion

Due to its multifaceted nature and inherent complexity, traditional knowledge elicits different understandings and definitions from various stakeholders, making consensus difficult to achieve. Based on comprehensive analysis of existing traditional knowledge concepts and agricultural heritage definitions, this paper provides a preliminary conceptual definition of traditional knowledge within agricultural heritage systems. This definition remains exploratory and requires further in-depth research.

As an important component of agricultural heritage systems, traditional knowledge represents not only valuable assets held by ethnic minorities, communities, or collectives within heritage systems but also constitutes part of the outstanding value of agricultural heritage, exerting positive influences. However, constrained by its own characteristics, once discarded, traditional knowledge disappears forever, representing a significant loss for ethnic minorities, agricultural heritage sites, and the nation as a whole. Therefore, protecting and transmitting traditional knowledge in agricultural heritage systems is a shared responsibility of all residents, local governments, and heritage managers. Effective protection and transmission can preserve this intangible wealth while playing a crucial role in the conservation and development of agricultural heritage systems.

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Note: Figure translations are in progress. See original paper for figures.