

Sustainable Management of Natural Resources Based on the Indigenous knowledge: Case of Jiabang rice terraces in Guizhou, China

Zhengxu Zhou
Tsinghua University

Nian Wang
Urban Planning & Design Institute of Shenzhen

Ming Fang
Beijing Forestry University

Abstract

The indigenous knowledge of remote mountainous communities is closely related to cultural diversity. Due to the steep terrain, limited habitat, difficulties in accessing natural resources and vulnerability to natural disasters, the mountain villagers have formed a set of indigenous knowledge, emphasizing the adaptation and moderate transformation of the environment, thus form a sustainable method of managing natural resources. The Jiabang rice terraces in Guizhou Province, southwestern China, locates deeply in the mountains, the isolated area of Jiabang Rice Terraces has kept the local farming traditions relatively intact. The Hmong people, an ethnic group who live in the area, use indigenous knowledge to create a unique “rice-fish-duck” eco-agricultural system and settle down for generations. Take three villages in the core area of Jiabang rice terraces as objects, this paper investigates the distribution patterns and relationships of Hmong cultural landscapes, summarizes their sustainable indigenous wisdom, describes the indigenous knowledge system followed by the local Hmong people in the process of building their homeland and managing natural resources, and explores the intergeneration differences in the cognitive level and inheritance of the indigenous knowledge system by local Hmong people. Moreover, the article also pays special attention to how the indigenous knowledge and culture play active roles facing a series of changes of the village brought about by urbanization and industrialization, especially in the mountainous areas where

the relationship between man and land is relatively tight and the ecology is relatively fragile.

Introduction

The maintenance of culture diversity is a global issue. Residents in remote mountainous areas have developed a lot of indigenous knowledge in the process of building their own habitats. Due to the steep terrain, limited habitat, difficulties in accessing natural resources and vulnerability to natural disasters, the indigenous knowledge must emphasize the adaptation and moderate transformation of the environment, thus form a sustainable method of managing natural resources, and ultimately build a unique home. Many scholars have discovered that the basic assumptions of traditional knowledge and cultural sustainability are closely related, which can be a guiding source for modern people to do researches on sustainability. Sustainable development models are becoming effective measures to manage these possible crises, and traditional indigenous knowledge should be integrated into regional conservation and recovery planning (Altieri 2002; Nabhan 2000; Mauro and Hardison 2000).

Indigenous knowledge represents the experience that human beings have gained from the natural environment during thousands of years, and has formed a unique production and lifestyle under the influence of different regions and ethnic groups (Armstrong et al 2010). This knowledge system also includes long-term and close regional observations. Local people are associated with their land in a complex and intimate way. The depth of thinking and practice is unmatched by current research. The indigenous knowledge from the remote mountain communities is closely linked to

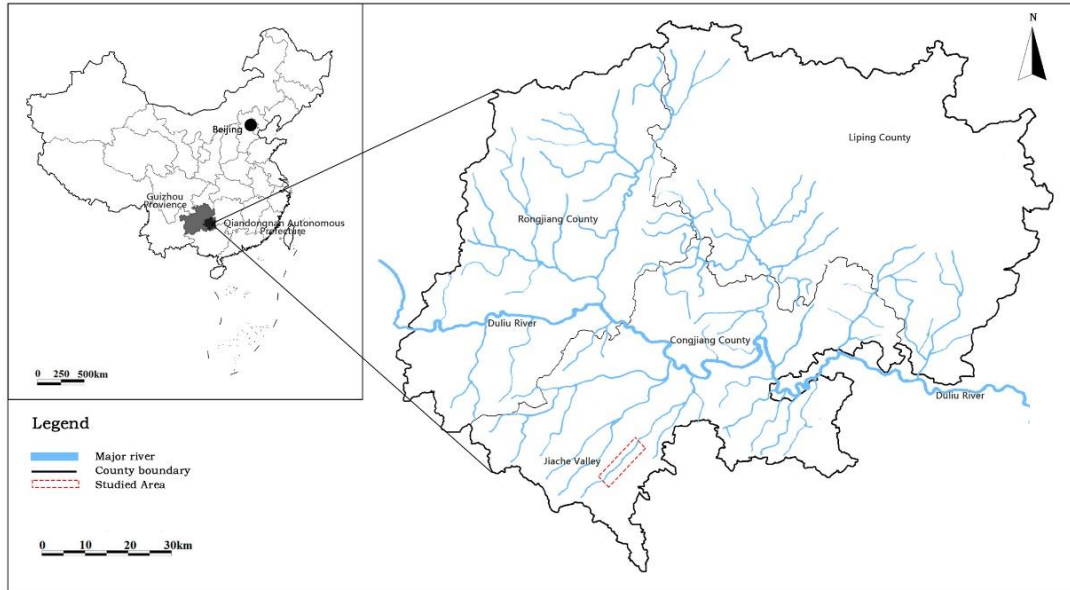


Figure 1. Location and view of Jiabang Rice Terraces

sustainable development, with particular emphasis on adaptation and moderate transformation of the environment, and forms a sustainable approach to managing natural resources. The knowledge come from traditional agricultural practices and pass on from generation to generation in a relatively isolated geographical space (Jiao et al 2012).

The Jiabang rice terraces in Guizhou Province in southwestern China is a case worth studying. Located deeply in the mountains, the isolated state of Jiabang Rice Terraces has kept the local farming traditions relatively intact. The Hmong people, an ethnic group who live in the area, use indigenous knowledge to create a unique “rice-fish-duck” eco-agricultural system and settle down for generations. Because of its universal philosophy of sustainable development and

unique cultural value, it was recognized as a Globally Important Agricultural Heritage Systems (GIAHS) site by Food and Agriculture Organization (FAO) in 2011. The Jiabang rice terraces has been isolated historically, so its large-scale, magnificent and prosperous terraced landscape is formed with little intervention from the outside world. This coordination with the environment has shaped local wisdom of sustainable development, which can be a guidance and reference for the sustainable development of human settlements in the future.

This article focuses on the following issues: how do mountain residents deal with the relationship between human and nature and manage natural resources in order to obtain the material basis for sustainable development in the process of building their own villages; and what role does

indigenous knowledge play in this process. Therefore, the article comprehensively discusses the indigenous knowledge systems that local Hmong people follow in the process of building homeland and managing natural resources, examines the distribution patterns and relationships of Hmong people's cultural landscape, and summarizing its sustainable ecological wisdom.

Materials and Methods

Study Area

The study was conducted in The Jiabang rice terraces (25°36' N, 108°34' E), 80 kilometers from the county seat on the northeast side of Congjiang County in Qiandongnan Hmong and Dong Autonomous Prefecture (Figure 1). As the largest terraced area distributed in the heritage area, The Jiabang rice terraces retain a complete traditional agricultural system, and is also one of the most representative mountain minority community concentration areas. The Jiabang rice terraces is in the hinterland of the Moon Mountains, with an average altitude at 800 meters and the highest peak at 1500 meters. The forest is dense and vegetation resources are rich. The local Hmong villages are distributed along the Jiache River Valley on the mountainsides. Among them, the three villages of Jiache, Jiaye and Dangniu is surrounded by the largest-scale terraces. The stilted houses of the Hmong community stand in tiers along the terraces and form a unique rice terraces landscape.

Methods

1. Interviews. We conducted field surveys in the Jiabang rice terraces three times in total, an initial visit to the village in April 2016, mapping of the villages, land use surveys and in-depth interviews with key stakeholders in July 2017. In January 2019, an on-site interview survey was conducted in three villages. With the support of the local volunteers, about 10% of the villagers from a total of more than 1,000 households was selected to be interviewed. The structured interviews aims to understand the basic livelihoods and the level of awareness of indigenous knowledge in natural resource management of the villagers in the region.

2. Participatory mapping. In order to expand the community integration research methods beyond the traditional research methods, this paper combines participatory mapping with in-depth interviews, and important ecological spatial scope and practice mode are determined

on the basis of geographic information systems (GIS). Participatory mapping combined with GIS has been one of the most important research tools to acquire indigenous knowledge of rural communities in recent years (Dunn 2007; Talen 2000). Participants mark important positions based on their own experience. When provided with printed base maps of land coverage, the respondents can identify and label important cognitive locations and boundaries based on actual knowledge. In the interview, the respondents were asked to identify the scope of the farmland belonging to each village group (each village consists of several groups), and the parade paths of the major festivals, and finally form the landscape maps.

Result

The Hmong people in The Jiabang rice terraces placed more emphasis on adaptation into and co-prosperity with the nature in the process of settlement construction. Therefore, a unique indigenous knowledge system has been formed in the process of natural resource management (Table 1), and are divided into the following two parts:

Indigenous knowledge of mountain protection and Woodland management

The Jiache River Valley, where The Jiabang rice terraces are located, has large-scale secondary forests dominated by *Pinus massoniana* and *Cunninghamia*, as well as native evergreen broad-leaved forests. The *Cunninghamia* tree is an indispensable material for the house construction in Hmong Village, and many other materials for daily life are also obtained from the forest. Therefore, Hmong villages are often surrounded by forest area, in which harvesting and hunting are forbidden. It is called Feng Shui Forest by local people, a sacred place that can protect the village's sustainable development. The villagers regard Feng Shui Forest as a shelter of their villages. In the high-altitude mountainous areas where the mudslides frequently occur in The Jiabang rice terraces, the forest land that can stabilize the water and soil is a significant guarantee for the Hmong people to settle down.

Indigenous knowledge of agricultural management and water resources management

The rice-fish-duck eco-agricultural system in The Jiabang rice terraces is a representative of the local three-dimensional mountain agriculture. The local soil is mostly black sandy

Table 1 Local major natural resource management and indigenous knowledge systems

Type of ecological space	Natural resource management	indigenous knowledge systems
Mountain	Mountain protection	Mountain disaster recovery Soil rotation and fertilizer
Woodland	Forest management	Firewood forest construction Water conservation forest maintenance
Farmland(rice terraces)	Rice-fish-duck agricultural management system	Traditional crop planting Rice-fish-duck management Glutinous rice collection and processing
Water	Water resources guidance management	Deep-water rice field construction Ditch construction and maintenance

loam, which is fertile and conducive to the growth of local traditional crops such as rice, glutinous rice, corn, etc. The characteristics of resistance to low temperature and anti-shading of these crops also provide innate advantages for the rice production of the Hmong people. They adopt methods such as concentrating the terraces instead of breaking the rock foundation, enhancing the soil and cultivating the grass, to cultivate strips of farmland of different sizes along the ridge of the Moon Mountain, and to breed a suitable proportion of carps, grass carps and ducks in these terraced fields through artificial means in different time periods, so the production these three major compatible agricultural and livestock products is optimized in a limited space. These animals and plants are native species that can survive in the wild even without artificial cultivation, reflecting the local wisdom of the Hmong people to adapt to local conditions. The deep-water paddy fields built by the local people can effectively alleviate the hazards of landslides and mudslides, and at the same time serve as flood storage to maintain the usual irrigation water.

Due to the obstruction of the terrain, the terraced terraces are bounded by the watersheds on both sides of the valley, forming a relatively closed geographical unit, whose overall landscape pattern consists of mountains, water, forests, fields and villages within the space of the valley. Terraced fields generally start from the foot of the mountain and spread on the slopes suitable for reclamation up to the mountainside or the shoulders of the mountain to form a continuous layers of belt-shaped rice terraces landscape.

The forest is mainly distributed on both sides of the river, above the mountainside and between the deep valleys, function as a natural base for water conservation and soils stabilization. The villages are mainly distributed around the terraces and are also closely connected with the woodland, forming a top-down spatial pattern of the forest-settlements-rice terraces-river buffer zone as altitude changes (Figure 2).

Role of culture in Jiabang Rice Terraces

Traditional culture has played a fundamental role in the space construction and the development of social livelihoods in Jiabang rice terraces. The customs of the local Hmong people are the embodiment of the traditional rice farming memory, including the folk skills and the related series of festivals. Major festivals have become a beacon of belief in the local Hmong people's minds, further strengthening the role of traditional rice farming culture in the implementation and inheritance of local indigenous wisdom. The New Rice Festival is the most important festival for the Hmong people in Jiabang area, generally around August 15 according to the lunar calendar. After the busy harvest, Zhailao, the most prestigious person in the village, will organize the more respected villagers to negotiate the specific date of the festival. During the festival, the villagers who work and study in other places will come back in spite of the distance, and celebrate with the elderly and children left behind in the village, and the young people will organize to perform the Lusheng, a native instrument, in the village (Figure 3).

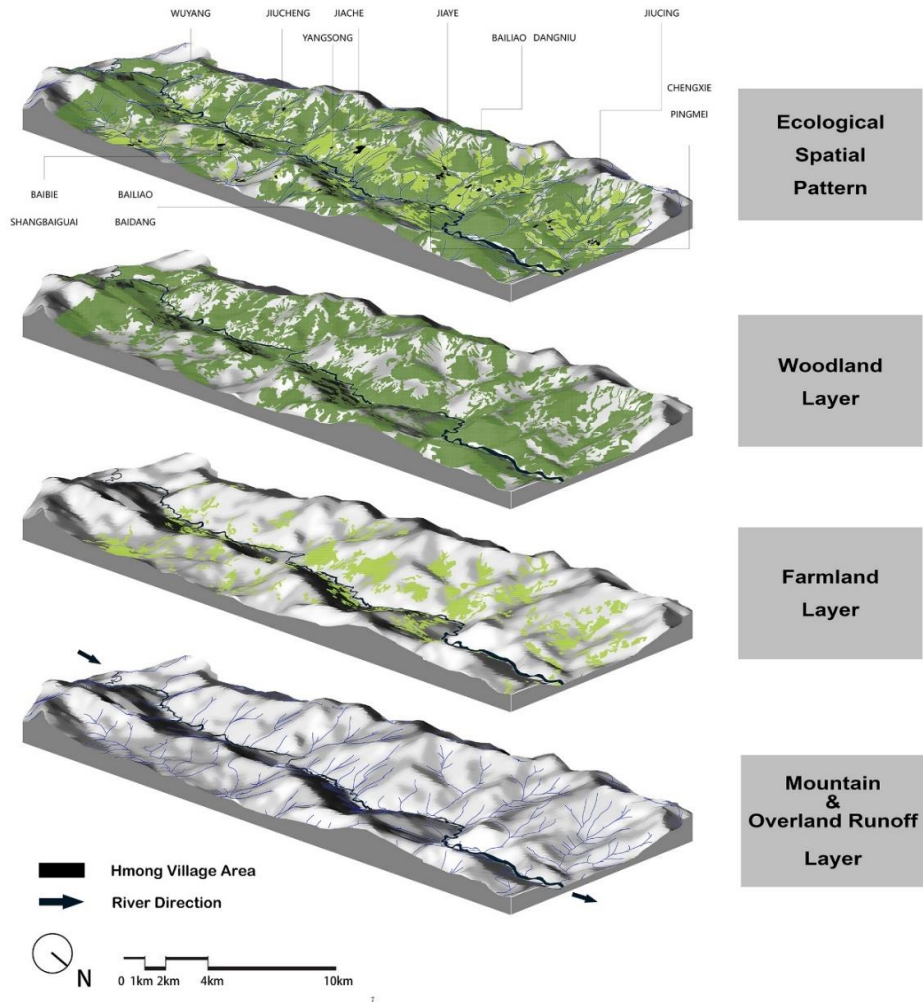


Fig. 2 The ecological pattern of Jiabang Rice Terraces under the management of natural resources

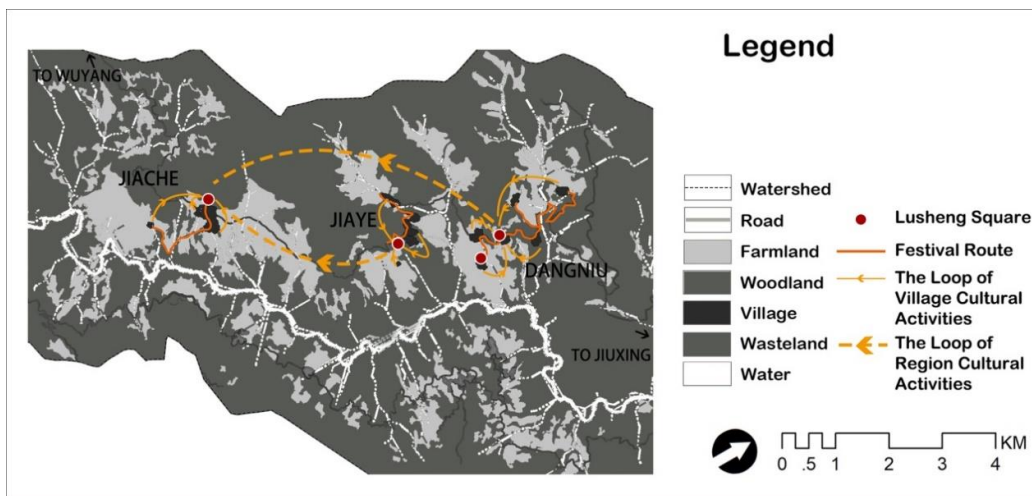


Fig. 3 Landscape map of the cultural route of the New Rice Festival

Conclusion and Discussion

The Hmong people in the terraced mountainous communities have formed an indigenous knowledge system for natural resource management rooted in the mountains during the long-term production, and thus formed corresponding settlement spaces. The joint force of space management and knowledge system form the unique mountain rice farming culture. This culture emphasizes biodiversity and systematic spatial management. It is highly sustainable and reflects unique mountain and national characteristics. It has been playing a fundamental and core role in local community development for hundreds of years.

Although the community in Jiabang rice terraces is still undergoing many challenges in the process of transformation and development, the following policy issues, we believe, can provide reference for many mountain communities at the global level. First, choose the appropriate direction of community development transformation, with a focus on inheriting cultural, indigenous knowledge system and natural resource management models, with particular emphasis on maintaining the sustainability of mountain communities. Second, it is necessary to pay attention to the inheritance of local indigenous knowledge, as well as the introduction of new knowledge and new horizons in the education of younger generation, so they, as a backup force, can play a greater role for the development of mountain communities. Third, it is necessary to balance the contradiction between protection and development, respect and protect the local traditional agricultural landscape, and avoid excessive commercial tourism development which may bring destruction of the local natural ecological space and traditional culture.

Endnotes

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