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Community-based indigenous irrigation system and its hydrological effects on Hani Rice Terraces

Xuan Gao, Yuanmei Jiao, Mei Wang, Xin Liu, and Zhiqiang Ding
School of Tourism and Geography Science, Yunnan Normal University, Kunming,China

With the condition of sufficient water-vapor brought by Pacific and Indian Ocean monsoon, the Asian-Pacific region where the wet rice farms are wildly distributed is assumed as the granary of our planet. In the mountainous areas, cropping activities on terraces has been maintained by the minorities for hundreds even thousands years. We can find rice terraces in Thailand, Vietnam, Philippines, Indonesia, as well as in the south part of China. The culture landscape of Hani rice terraces as the largest area of terraces in China, with a proved history of more than 1300 years, has been inscribed in the 2013 world heritage list of UNESCO. For that large area of wet rice farm in mountains, the utilization and management of water sources play a critical role. The aim of this research is to explore how the irrigation system in Hani rice terraces works and its hydrological effects.

We chose Quanfuzhuang village in the heritage area as study area. Through interview with farmers and field study to investigate the structure of local irrigation system and how it works. Then simulation was conducted in ArcGIS with data of DEM, land use and cover, and soil moisture, to understand the effects of irrigation system to the hydrological condition.

The results show 1) The local irrigation system consist of community-based indigenous management and physical irrigation network; 2) The indigenous management is by a community of farmers whose rice terraces obtain water from a common ditch. There are three levels in it, the traditional way of ditch leader election, his responsibility, and the regulations of water distribution. 3) The physical irrigation network consist of river, canals, pools, and woodcarving allocators. The whole network lay in forest and terraces, in which the forest as the water source area, while the terraces as the irrigated area. 4) The community-based indigenous irrigation system changes the natural physical pattern of rice terraces. Compared with the water pattern in forest area which is nearly not disturbed by human activity, the hydrological connectivity analysis shows heterogeneity, i.e. high in valley and low in ridge. But in the region of rice terraces which is half-artificial, the water connectivity shows homogeneity.

Conclusions come that the well-organized irrigation system, through community-based management and physical irrigation network, is conducive to the hydrological homogeneity. Thus the continuity and integrity of the terraced landscapes is of great significance to the heritage conservation and agriculture sustainability.