

ORIGINAL ARTICLE

Regenerating tradition: Empowering rural revitalization through Li culture and green infrastructure in a design case study of Yulong village, Hainan, China

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Abstract

Green infrastructure is an approach to land planning that aims to restore and manage the natural environment within human contexts. Its widespread use in post-industrial urban and peri-urban settings recognizes the need to reconcile environmental issues and regenerate social and cultural connections with the natural landscape. However, green infrastructure is seldom discussed in rural contexts, where efficient production practices increasingly dominate agriculture, invariably overwhelming cultural associations with land and its environmental qualities. In China, a government policy has been introduced to revitalize rural areas in response to the deleterious environmental effects of industrialized agriculture. Green infrastructure, in this context, offers the potential to usher in a new transformation toward more ecologically sustainable rural environments that embrace environmental, social, and cultural connections. This research considers the role of traditional rural cultures in facilitating this transformation. Through a case study of Yulong Village and its agricultural fields in the middle reaches of the Changhua River in Hainan, this paper maps the modernization of the traditional Li family's agrarian culture and its legacy of ecological dilemmas. In projecting forward, this article describes a design research process that deploys new and established cartographies and speculates on the role of landscape design in integrating ancient cultural traditions with modern agriculture. The findings suggest a path for the realization of the goal of rural revitalization, emphasizing the importance of recognizing the relationship between ecological, economic, cultural, and social values.

Keywords: Landscape architecture; Eco-cultural tourism; Eco-agriculture; Traditional knowledge; Community-led change

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Citation: Wu, K., Bryant M., Toland A., He, Y. & Chen, B. (2024). Regenerating tradition: Empowering rural revitalization through Li culture and green infrastructure in a design case study of Yulong village, Hainan, China. *Journal of Chinese Architecture and Urbanism*, 6(2), 1304. <https://doi.org/10.36922/jcau.1304>

Received: July 13, 2023

Accepted: August 15, 2023

Published Online: March 13, 2024

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1. Introduction

Over the past century, rapid urbanization and modernization on a global scale have caused tremendous disturbances to the natural environment and its ecosystems. While

material living standards have substantially improved for significant portions of the world's population, ecological problems have emerged as a serious threat to humanity's continued survival.

Since entering the academic and professional lexicon in the United States in the 1990s (Seiwert & Rößler, 2020), the concept of green infrastructure has found wide application in urban planning, urban forestry, and urban greening efforts in both the United States and Europe. Grabowski *et al.* define green infrastructure as “a system of interconnected ecosystems, ecological-technological hybrids, and built infrastructures that provide contextual social, environmental, and technological functions and benefits” (Grabowski *et al.*, 2022, p. 158). It now underpins many government planning policies worldwide. While its original focus was primarily on the protection, enhancement, and management of stormwater and river systems, ecological services, and biodiversity conservation (Ying *et al.*, 2022), it is increasingly called on to reconcile the trade-offs between ecological function and human land use demands, particularly in the face of climate change. As a planning concept, green infrastructure “brings attention to how diverse types of urban ecosystems and built infrastructures function in relation to one another to meet socially negotiated goals.” (Grabowski *et al.*, 2022, p. 158).

More recently, the community and cultural value of green infrastructure has become a subject of extensive debate in academic literature. Kati and Jari (2015), for example, emphasize the importance of the multiple meanings and values generated by community interests in green infrastructural design, advocating for the integration of locally derived values as part of the techno-economic planning strategy for urban ecosystems. Orantes *et al.* (2017), in their study of Yesan County's green infrastructure program in South Korea, highlight the increasingly important role of cultural heritage and religious values in the green infrastructure planning process. Razzaghi Asl and Pearsall (2022) conclude that green infrastructure has the potential to integrate small-scale design with local governance models. These studies suggest that green infrastructure can be interpreted in various ways to support diverse sociocultural contexts, although the current debate remains primarily centered around urbanism.

The recent rapid urbanization in China has provided a rich testing ground for green infrastructure research through urban case studies. However, there is a notable gap in research concerning innovation in green infrastructure design methods suitable for rural settings and environments in the countryside (Shao *et al.*, 2023; Yang *et al.*, 2023; Ni *et al.*, 2023). This article seeks to contribute to this developing area of research.

After more than 70 years of “rural reorganization” and “opening up” in China, the economic livelihoods and living conditions of rural inhabitants have prospered. However, the abandonment of traditional agricultural practices in favor of modern industrialized agricultural processes has led to the erosion of intangible cultural heritages among rural ethnic minorities and the degradation of the broad-scale environment. This development prompted a reframing of modernization in 2022. The 20th National Congress of the Communist Party of China proposed a “rural revitalization” with a new form of common prosperity, which acknowledges the harmonious coexistence of humans and nature. This proposal builds on various suggestions by Chinese scholars, advocating for the development of high ecological service value in ecoagriculture, rural cultural tourism, ecological capital deepening, and agricultural finance innovation, among other options. These are considered key initiatives to re-establish the cultural landscape of the countryside (Tong, 2023; Liu, 2023; Zhang, 2021; Wen and Lu, 2021; Xiang, 2023). The government's 2023 “No.1 Document on Rural Revitalization” recognizes the benefit of “in-depth farming culture inheritance and protection projects, and strengthening the protection and utilization of important agricultural cultural heritage.” However, implementation of these measures will not be easy. The loss of cultural traditions in the earlier periods of “rural reorganization” has already generated a lack of knowledge and authenticity in many expressions of rural culture (Liu & Xu, 2022).

Using Li Yulong Village in the middle reaches of the Changhua River of Hainan Island as a case study, this research investigates how the integration of modern green infrastructure methods with traditional agricultural practices might promote rural revitalization and enhance the future development of rural villages in China. Some scholars have already explored the human-ecological connections embedded in the traditional practices of the Li family (Chang, 2012), suggesting that Li family's farming culture demonstrates profound human-environment relations in both Li villages and farmlands (Qi *et al.*, 2022). However, a gap still exists in current research regarding the regeneration of ecological landscapes based on Li family's traditional farming culture. In this respect, green infrastructure holds the potential to leverage Li family's traditional knowledge and generate community-based practices suited to rural revitalization in Yulong Village, effectively integrating sustainable ecology, culture, and economy.

In this article, we first analyze the ecological and economic predicament of Yulong through historical materials, documentation, field investigation, and satellite imagery. Second, by examining historical paintings and

existing anthropological and ethnographic research about the Li family, we interpret the Li family's beliefs and the value of traditional agricultural practices in modern rural life. Then, employing a design research methodology that utilizes advanced technologies, we elucidate the potential for locally and culturally informed green infrastructure interventions in Yulong Village. This approach enriches the study of green infrastructure by intertwining it with traditional culture and provides a potential prototype for the revitalization of the Li villages in Hainan.

2. Methods

2.1. The study site

2.1.1. Modernization of the Yulong village

At the time of the founding of New China, the Li villages in Hainan were in a state of poverty. In the 1950s, the Chinese government reformed the organization of these villages and funded the introduction of modernization in agriculture. The Hainan government established rural production cooperatives, allocated collective land to all Li farmers on the island, and introduced modern farming tools and high-quality rice cultivars, all of which greatly improved agricultural productivity (Li *et al.*, 2009). However, rural labor and agricultural production were priced at a low rate due to the state's need to accumulate its economic foundation through the surplus value of rural agricultural production. The limited income of farmers resulted in an increase in cultivation areas, including reclaimed forests and other unfarmed land (Wen *et al.*, 2018). The Reform and Opening Up in the 1980s, further, increased the commercialization of agricultural production and led to the extensive introduction of tropical cash crops in Hainan. During this period, agricultural reforms were accompanied by the household responsibility system, which encouraged increased entrepreneurial activity among Li villagers, who thereby accrued substantial increases in economic income (Figure 1).

However, the transformation adversely affected the natural landscape and ecological environment of the Li villages. Large areas of mountain forest and riverside wetlands were cleared to make way for cash crops such as mango, betel nut, and rubber. In the new landscape dominated by cash crops, the extensive use of pesticides accelerated the acidification of the soil. In the old-growth forests, rosewood was harvested on a hitherto unseen scale to service the demands of the international furniture market. Much of it is now depleted, along with many natural habitats and a significant portion of native fauna. The decimated populations of frogs, birds, and other ecologically important animals have led to locust infestations along the riverbanks, in the villages, and in the

rice paddies. To compound these problems, the absence of vegetative cover has accelerated runoff, which has initiated perennial flooding in the villages and fields (Figure 2). In response to these challenges, the Daguangba Reservoir was built in the late 1970s in the middle reaches of the Changhua River to regulate floodwaters (Figure 3) and to meet the increased demand for water in urban expansion and for farm irrigation. Unfortunately, historic and satellite images from the late 1990s to the present reveal that the reservoir has adversely affected the alignment and flow of the river. The construction of the reservoir has resulted in changes to the natural hydrology, gradual loss of the original floodplain, and shrinkage of the village's farmland. Many Li villages were abandoned, and the government consolidated some of the low-lying villages, like the Yulong Village, into new settlements along the new edge of the reservoir (Figure 4). In doing so, the villagers lost the physical qualities and the spaces where they once practiced some of their centuries-old traditions of sustainable farming.

2.1.2. The Li family's tradition of sustainable farming

The ancestors of Hainan's Li family were part of the ancient Hundred Yue tribes in the present-day Guangdong and Guangxi regions of China, who migrated to Hainan Island. They formed tribes with different dialects and made a living through fishing and hunting in the coastal areas. From the Han dynasty (206 BCE–220 CE) onward, following maneuvering and friction between the Li minority and representatives of imperial powers and Han Chinese settlers, the Li family gradually migrated to the western interior of Hainan Island, settling in the upper and middle reaches of the Changhua River basin (Figure 5) of Hainan Island (Wang and Jiang, 2004). The terrain along the Changhua River is mountainous in the southeast and low flatlands in the northwest. The mountainous areas feature steep slopes and rapid water level changes, while the lower reaches have a wide riverbed and smooth water discharge (Stubel, 1937).

Long-term interaction with the Changhua River and their acute understanding of the landscape have gradually led the Li people to habitually reside close to water. This is evident in the Qing dynasty painting depicting Li family's traditional customs, showcasing their cultural techniques for managing and engineering water resources. In the mountainous areas, where the Changhua River served as an important transportation route, the ancient Li family developed rafts capable of transporting materials even in places with fast water currents (Figure 6A). Qing dynasty paintings (Fu, 2007) illustrate how the Li people built stone barriers at the rapids of rivers and streams, filling them with aquatic plants to trap fish. Beneath waterfalls, they created small ditches with a narrow water source,

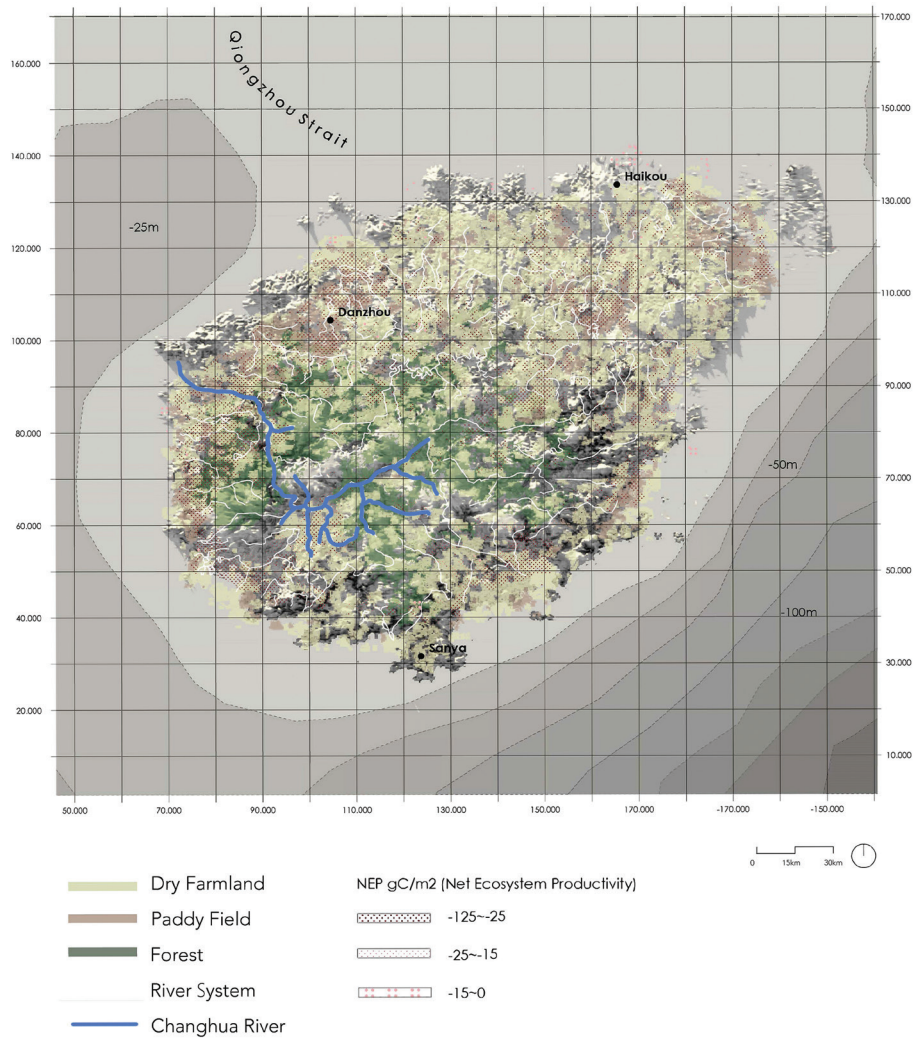


Figure 1. Map of Hainan Island. Source: Drawing by the authors



Figure 2. Images of Yulong Village. Source: Photos by the authors

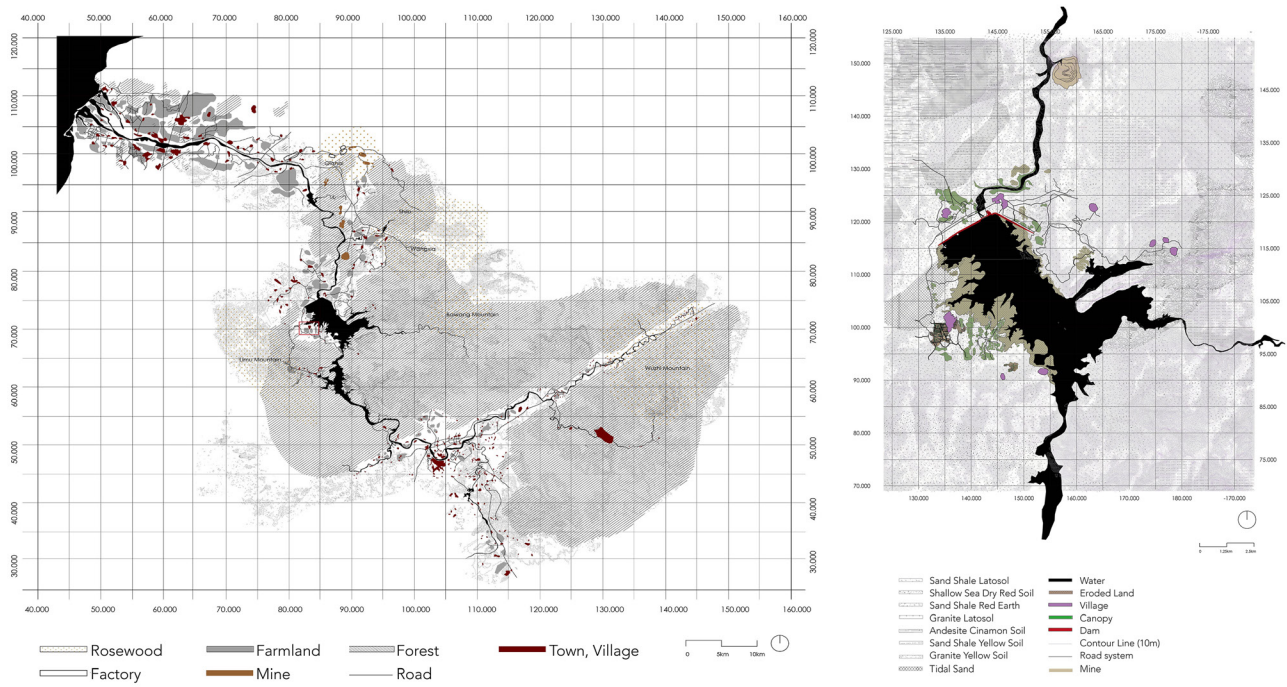


Figure 3. The maps of Changhua River and Daguangba Reservoir. Source: Drawings by the authors



Figure 4. Satellite image of the Daguangba Reservoir and its edges. Source: Photos by the authors

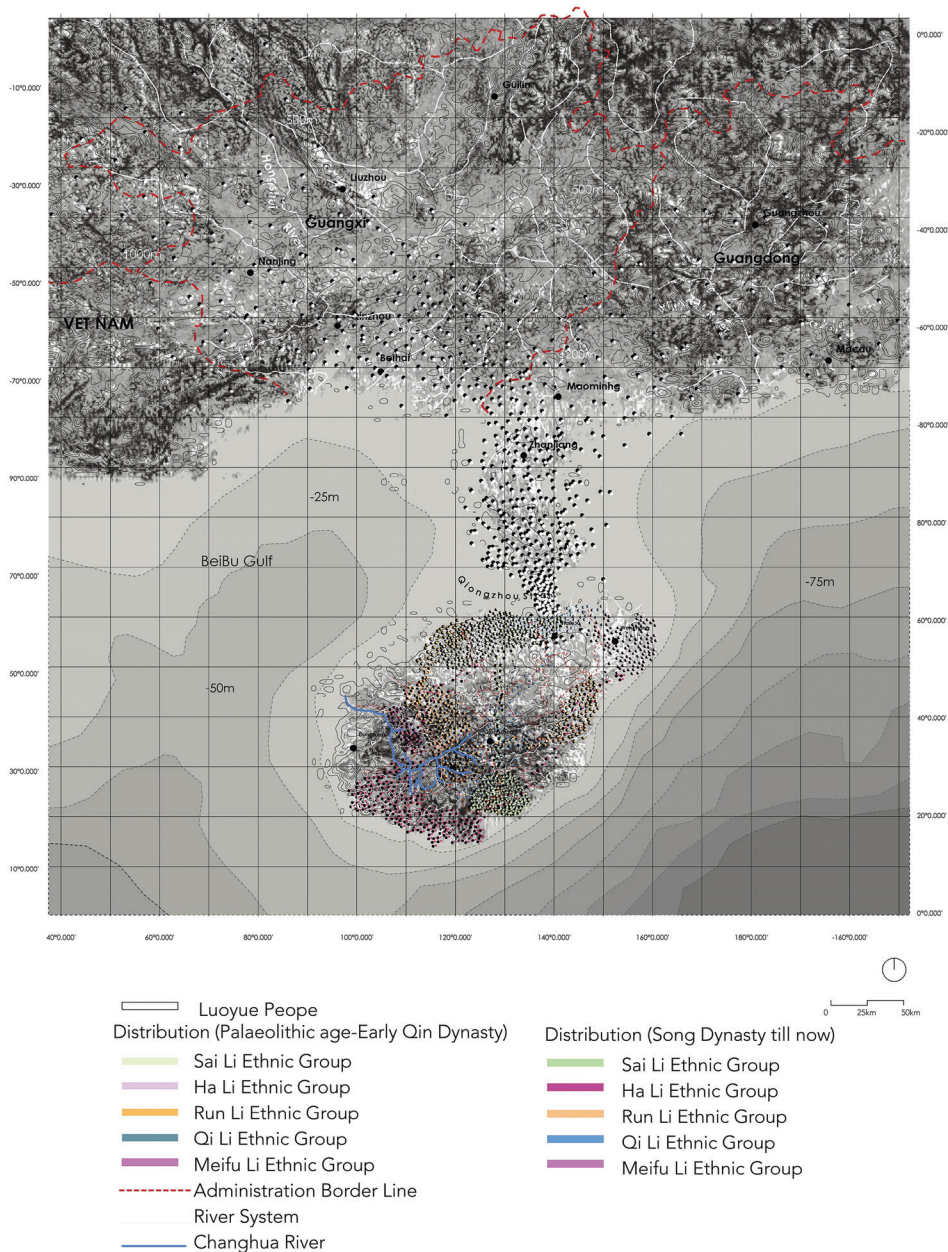


Figure 5. Li anthropology mapping. Source: Drawing by the authors

closing them off to net fish (Wen & Wen, 2012). In the lower catchment wetlands and low-lying areas near rivers, the Li family built open canals in their paddy fields and cofferdams in the rivers. These dams, constructed with stones or soil, would block one-third or even half of the river, creating a water diversion. This diversion allowed water to flow into the open canals irrigating the fields until filled, at which point the cofferdam would be removed. In areas with varying levels of rice fields, the Li family managed rainwater by diverting it through ditches

and then, using a hollowed-out log, diverting the water between the fields.

Knowledge of natural resources also enabled the ancient Li family to accumulate rich practical knowledge in adapted agricultural production, fostering a self-sufficient small-farming economy. They employed cows to break up the soil and provide natural fertilizer. Chickens freely foraged in village streets. In the fields, the Li family practiced crop rotation to restore soil fertility and planted crops such as



Figure 6. (A) Li traditional water management. (B) Li traditional farm activity. (C) Li traditional plant use. Source: Scans from *Li nationality's custom pictures of Qing dynasty*

sweet potatoes, mung beans, and peas to increase leaf area and ground cover, improving biological nitrogen fixation and reducing soil erosion. Through their cultivation practices, the Li family developed Shanlan rice, a grain unique to the Li village areas of Hainan (Figure 6B). This rice variety is well-suited to the seasonally dry slopes with low soil nutrients (Wang and Jiang, 2004). Unlike modern cultivars, it grows without the need for extensive pesticides or chemical fertilizers. Due to the low population density and large forest area in the Changhua River basin before the modern era, the cultivation activity of “Kanshanlan” increased the grain productivity of the ancient Li people, enabling them to maintain self-sufficiency. In addition, it was distilled to produce local rice wine.

Evidence from paintings from the Qing dynasty (Fu, 2007), demonstrates the distinctive self-sufficiency of the ancient Li family in the use of local plants for clothing, food, housing, and transportation realms (Figure 6C). Wild hemp, herbs, and bark were used for weaving and dyeing. Rattan and bamboo were used in building traditional Li family’s boat-shaped dwellings, weaving baskets, traps, rice sieves, and dustpans, and crafting bamboo rafts. Local herbs and bark were soaked and heated to create natural dyes, while various plants served medicinal purposes. This culture, developed in homes, by the river, and in the fields, illustrates that the Li family’s sustainable farming practices were rooted in their profound knowledge of natural resources.

The conscious knowledge of plants and animals in promoting healthy land and people perpetuates a spiritual attachment and belief system for traditional Li family. They believe that elements of the natural world serve as a medium that connects the divine realm with the everyday world. Different gods and ghosts govern the natural environments, and humans must take care not to offend

these entities through reckless or disrespectful behavior toward nature (Wen & Wen, 2012). Fearing punishment for disturbing the ghosts of the earth during planting activities, Li family’s farming traditions impose restrictions on the extent of agricultural planting. Not surprisingly, they view planting rice for food as a gift from the earthly god. During the pre-modern period, before planting each year, Li elders performed rituals in the mountains to pray to the mountain god for their blessings on agricultural production. They maintained a worship of Shanlan rice and pray to it after the harvest, holding a “Shanlan Festival” (Wang *et al.*, 2004). In addition, they had an attachment and affection for cows beyond their utilitarian value. Every year, on the eighth day of the 3rd month of the lunar calendar, Li farmers celebrated the Cow Festival by releasing their cows from daily toil in the fields and serving them glutinous rice wine to express gratitude for their hard work throughout the year (Wang & Jiang, 2004). Beside their villages, each family maintained a section of virgin forest as a cemetery, where human souls return to nature to rest in peace. Plants in these cemetery forest patches cannot be willfully cleared (Wang & Jiang, 2004). However, chickens, considered intrinsic to nature, are permitted to forage without it being considered an offense to their ancestors. This spiritual and material connectivity with animals is manifested in their special gratitude and goodwill for animal totems that they worship, considering the totems sacred and inviolable and forbidding hunting or eating them. Thus, the pre-modern Li family’s reverential admiration for nature fostered care and maintenance of sustainable production methods and daily life, intertwining nature and humans in enduring culture and traditions.

Today, traditional Li family’s agricultural practices and beliefs continue to influence the daily life of Yulong

Village residents. The people of Yulong Village maintain their worship and reverence for the mountains, forests, rivers, and land. In front of every house, there is a small shrine where the Li family make offerings to mountain god, earthly god, and other deities. Shanlan rice is still venerated; at the borders of some uncultivated mountains and paddy fields, the Li people continue to plant Shanlan rice and other local crops in small areas, preserving other traditions of crop planting and rotation (Figure 7). Shanlan wine, made from Shanlan rice, is still served at family gatherings and banquets. Even though the current residents of Yulong Village have been relocated at some distance from the ancestral forest cemeteries, modern Li family have adapted forest areas near where their relocated village meets their agricultural fields as a new cemetery, maintaining trees and plants in that area as lush as possible. While Yulong villagers no longer build boat-shaped houses, they still use local bamboo, rattan, hemp, and grass plants to build fences, barriers, and storage shelters. They also maintain traditions of gathering plants for weaving and dyeing cloth. Li women from all generations in the village often gather in their yards or in front of their neighbors' houses to practice and pass on traditional weaving techniques. In the yards, areas for storing modern agricultural machinery coexist with spaces reserved for growing local plants for home consumption and medicinal purposes. On the riverbanks, Li residents of Yulong Village still spontaneously gather to dig their own ditches, guided by the topography and the direction of water flow to secure water for irrigation. Every year, during the rise in water levels that floods the riverbanks, village children play in the shallows and fish from the shore. Older Li teenagers in the village are proficient swimmers and skilled in rowing boats, which villagers still use to transport tools, materials, and agricultural commodities (Figure 8).



Figure 7. Li traditional farm practice in Yulong village. Source: On-site photos by the authors

However, the dominant trend in modern agricultural development, primarily focused on quantitative growth, has largely eroded the beliefs and traditional farming practices of the Li family. With the damming of the Changhua River, uncontrolled development of land resources, modernized agriculture emphasizing cash crops, near-total abandonment of the “Kanshanlan” cultivation, large-scale deforestation of mountain forests, and the loss of animal habitats, the spatial opportunities for Yulong Village residents to maintain their traditional activities and associations with flora and fauna are becoming insignificant. Yet their knowledge systems may prove beneficial as global climates warm and biodiversity loss affects sustainability.

2.2. Green infrastructure design tools for Yulong Village

While the current environmental degradation is widespread, the future impact of intensified rainstorms and typhoons resulting from climate change poses an additional threat to the lives and landscapes of Yulong Village residents. This scenario anticipates an increase in flooding, landslides, and crop damage. Considering that the Li people have navigated changes and natural events for nearly 2000 years, there is likely value in exploring how to cultivate the regeneration of ecology – a green infrastructure based on Li family’s agricultural values.

Accordingly, we undertook a design research investigation of green infrastructure in the environment of Yulong Village. The aim of the green infrastructure design is to spatialize the potential for ecological adaptability to extreme weather, improve ecosystem health, restore species diversity, and continue traditional Li family’s agricultural autonomy. In regional settings in China, green infrastructure is primarily based on morphological spatial pattern analysis and multivariate curve resolution analysis tools. However, the limited accuracy of available data and the broad acreage of Yulong Village’s fields make these tools inadequate for coping with design at a relatively detailed scale. To address this, our project used other tools to elucidate on morphological possibilities of beneficial hydrology, community, and vegetation systems. Hence, our approach integrated existing satellite images, field surveys, Rhino 3D modeling, and McHarg’s “layer-cake” land suitability analysis.

We imported the topographic features of the site, recording them during the field survey and utilizing the clipped digital elevation modeling grid files. Subsequently, we used Rhino 3D modeling to depict the topography of the site and Grasshopper’s Stormwater Runoff Analysis

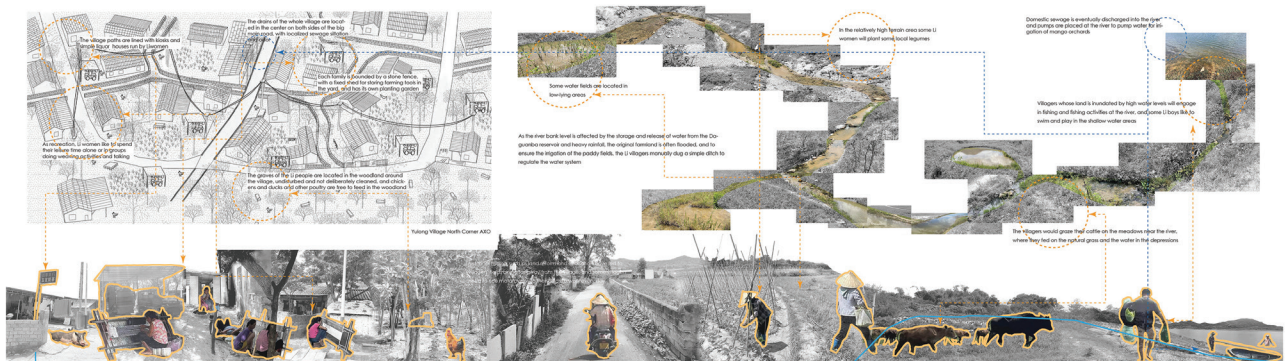


Figure 8. Vernacular life in Yulong Village. Source: Drawing by the authors

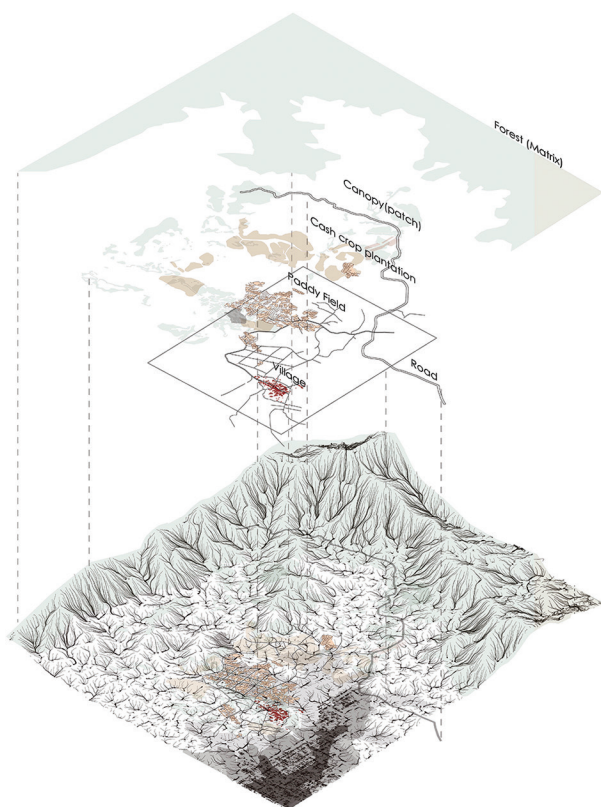


Figure 9. Runoff analysis. Source: Drawing by the authors

plug-in to identify potential depressions. Results propose a system of water corridors connecting these depressions in both the mountainous cash crop area and the lowland agricultural fields (Figure 9). This proposal catalyzed the exploration of design options for the riverbanks, where erosion problems are escalating due to frequent annual water-level changes.

We speculated on a series of riparian wetlands by simulating the submerged areas caused by rainfall and the rising of the reservoir’s water level. Superimposing the

water corridor system’s morphology through topographic modeling revealed potential benefits. These tools for hydrological modifications could project a succession ecology, with native mangroves eventually mitigating riparian erosion. Li family’s ecological knowledge, together with modern tools, could enable multifunctional benefits: the water corridor system brings sediment to the riverbank edge, shaping the riparian wetland, enhancing mangroves, restoring soil nutrients, and reducing flooding impacts on higher ground.

Our field surveys uncovered the narrative of Li family’s agriculture, encompassing abstract beliefs and concrete practices. This approach allows a deeper understanding of the spiritual core of Li family’s culture, even for those unfamiliar with Li family backgrounds. Despite the lacking of a written language, Li family’s farming traditions are usually kept alive by word of mouth between generations of the Li family clans and by subtle influences in daily life. In Li family’s farming traditions, the language of landscape and its flux has a strong vitality. Although modernization has greatly interfered with the communication of Li family traditions and, to some extent, diminished their carriers of language, the spiritual core of Li family traditions persists in the collective subconsciousness of Li descendants. This influence shapes the lives and behaviors of the current Li family members, enabling them to find a relatively comfortable way of life in the ever-changing environment. Protecting and enabling these oral traditions are crucial for the realization of rural revitalization. For this research, uncovering the remnants of living Li family traditions in text-based research posed a challenge. Mapping from field surveys proved more effective in understanding the Li people’s culture and agricultural sensitivity. Consequently, the research introduces a cartographic technique that may supplement the oral narrative, contributing to the revitalization of the diminishing Li family’s farming culture.

Guided by field surveys and an understanding of the significance of oral narratives, the design mapped the daily circulation pathways of the local Li people and analyzed the spatial expression of Li family's traditional belief systems. Leveraging satellite images to discern patterns of forest and shrub vegetation in the mountains, farmland, and village surroundings, we proposed vegetation corridors. These mappings were then superimposed onto the general shaping of water corridors to ensure that the morphology of the vegetation corridors fully covered the existing daily collection and ritual activities of the Yulong Village residents (Figure 10). To respect the living traditions of Yulong Villagers and avoid unnecessary disturbances, the fieldwork extended green infrastructure to a detailed scale within the village. Utilizing humble concrete drainage channels, the design incorporated a landscape strip of graminoid plants to facilitate rainwater infiltration and minimize the impact on village life. This approach in design research combined site-based interpretations with modern cartographic technologies, seamlessly integrating broader vegetation patches and field hydrology corridors into the village life.

3. Results

3.1. Empowering Li family's agriculture through green infrastructure in Yulong Village

The proposed green infrastructure network, consisting of water corridor and vegetation corridor systems, aims to improve the resilience of Yulong Village to weather extremes, will reshape residents' ability to connect with nature, and provide space for the revitalization of traditional Li family's agricultural activities. The design research shows how these goals can be achieved (Figure 11).

The Li village-based water corridor system in the mountain would serve to divert runoff from the slopes during heavy rains, preventing flood damage to the village and fields. In addition, it would collect rainwater during the dry season, providing irrigation for planting and sustaining the organisms in the vegetation corridors. Within the native amphibian-populated vegetation corridor system, species such as frogs and birds would contribute to controlling locusts (Figure 12).

Along the river's edge, mangrove shallows would provide a habitat for birds and amphibians, such as the Hainan

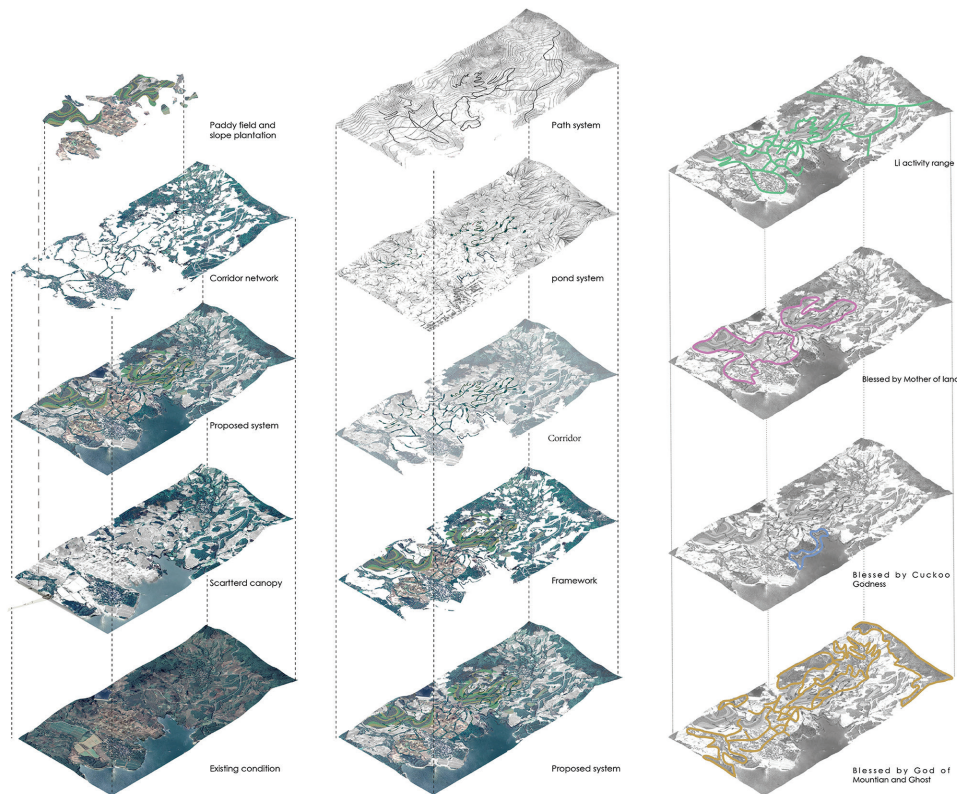


Figure 10. Green infrastructure morphology design. Source: Drawings by the authors

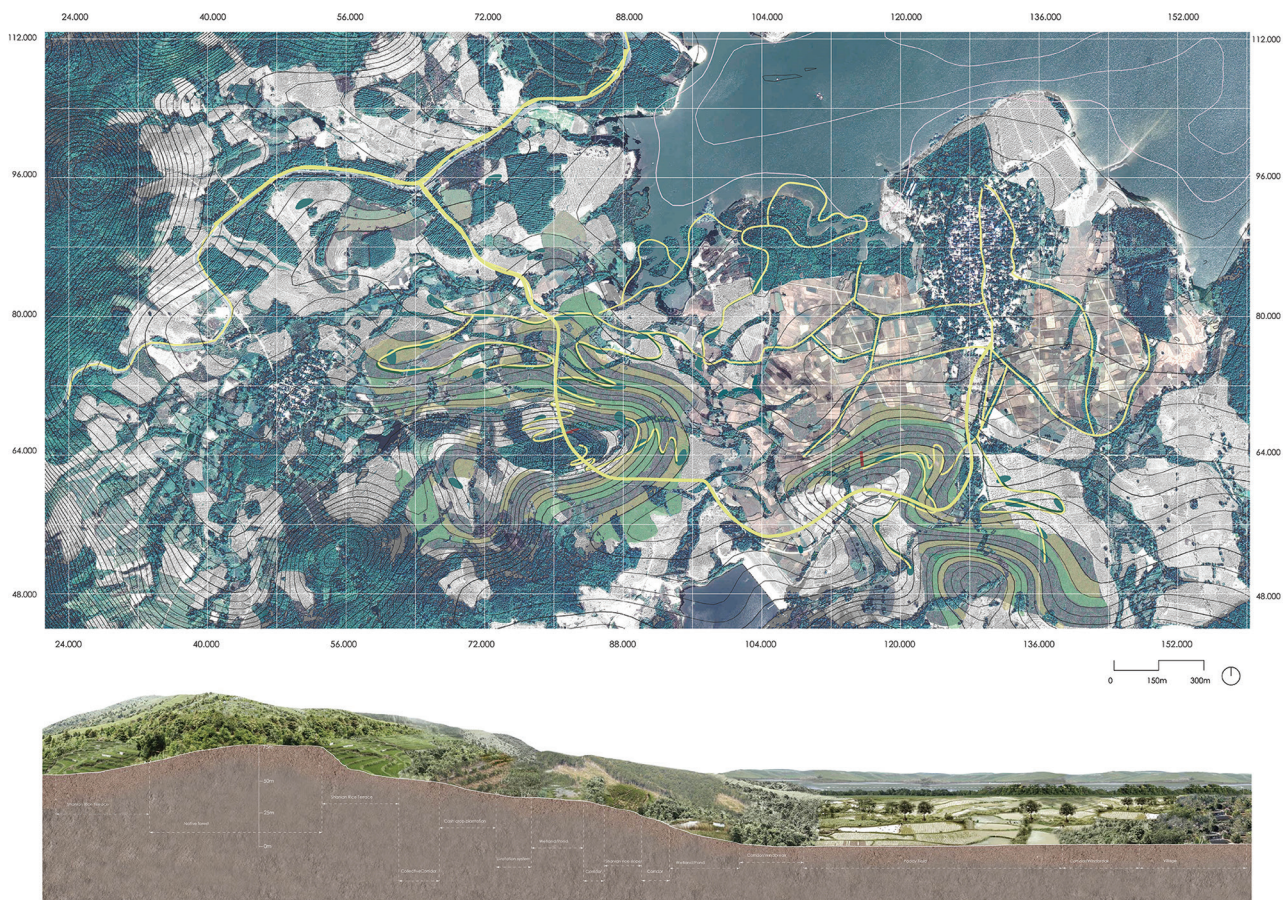


Figure 11. Yulong Village master plan and perspective section. Source: Drawings by the authors

black-faced spoonbill, which, in turn, help ameliorate locust infestation. The spoonbill, like many other native animals, holds significance as an object of totem worship for the Li people, and their return is important for the continuity of Li family's agriculture. A healthy riverbank space surrounded by mangrove shallows would also provide a safe environment for local activities such as fishing and children's water games.

Similarly, the green drainage canals in the village would function as miniature ecological corridors, attracting local insects and birds. These canals could become potential play spaces for Li children and foraging spaces for the poultry that roam the streets of Yulong Village. These localized vegetation systems, coupled with a broader vegetation corridor running through the entire production and living space of Yulong Village, would provide sufficient space for local animals to move and migrate. This setup ensures sufficient plant resources for traditional Li villagers gathering activities and offers context for Li elders to teach their children the skills of identifying and utilizing local plants, thus preserving and passing down traditions to newer generations.

With the integration of traditional water and vegetation systems, there is an opportunity to expand the cultivation of Li family's Shanlan rice and implement a crop rotation system on the slopes of Yulong Village. This approach aims to compensate for the constraints posed by recurrent flooding in lowlands and the extensive cultivation of tropical cash crops in mountainous areas. Traditional Shanlan rice cultivation practices, facilitated by the establishment of terraces for improved accessibility and safety on the slopes, can contribute to soil restoration. In addition, the traditional crop rotation and planting practices hold potential value in restoring and protecting the soil in Yulong Village. After a few rounds of Shanlan rice planting and traditional crop rotation, a healthy soil profile would enable the diversification of agricultural products, including the rotation with some tropical crops. This diversified approach aims to make land resources as sustainable as possible. By working in tandem with cash crops, these traditional agricultural systems can ensure both the ecological security of the sloping plantation area in Yulong Village and the economic security of the villagers (Figure 13).

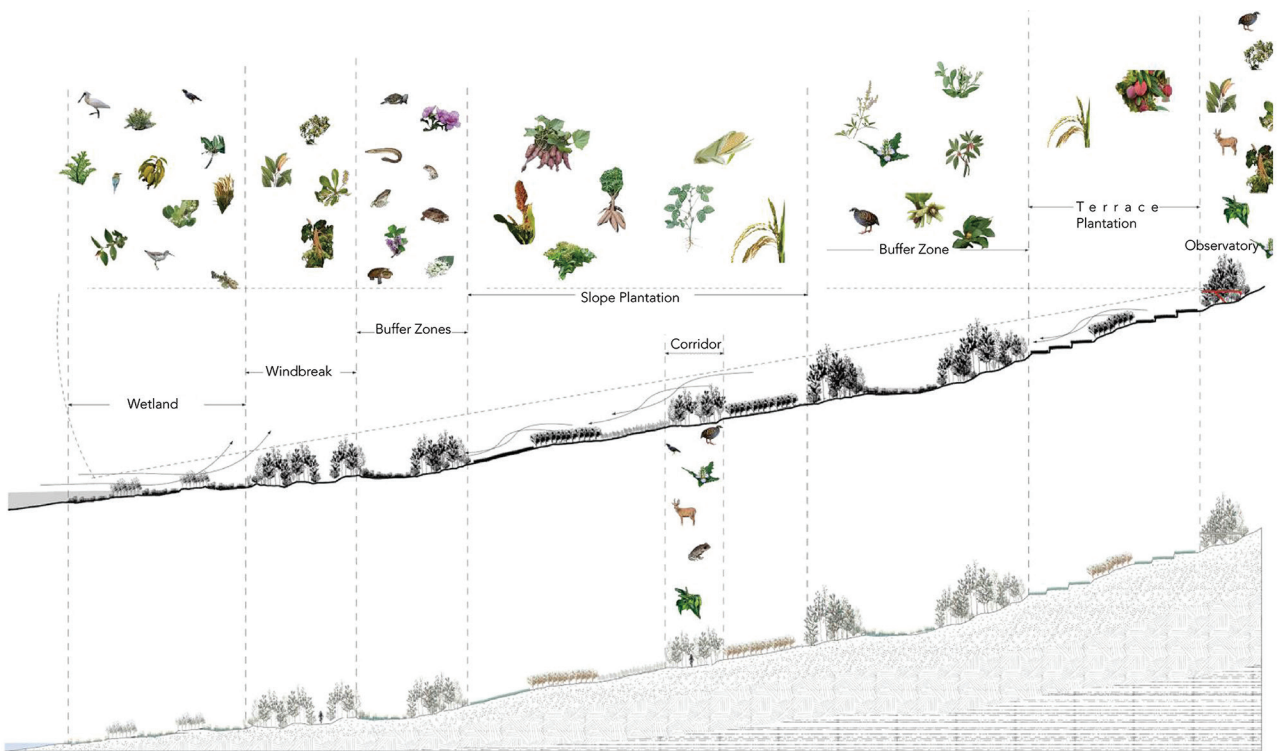


Figure 12. Plant corridor that protects the biodiversity of Yulong village. Source: Drawing by the authors

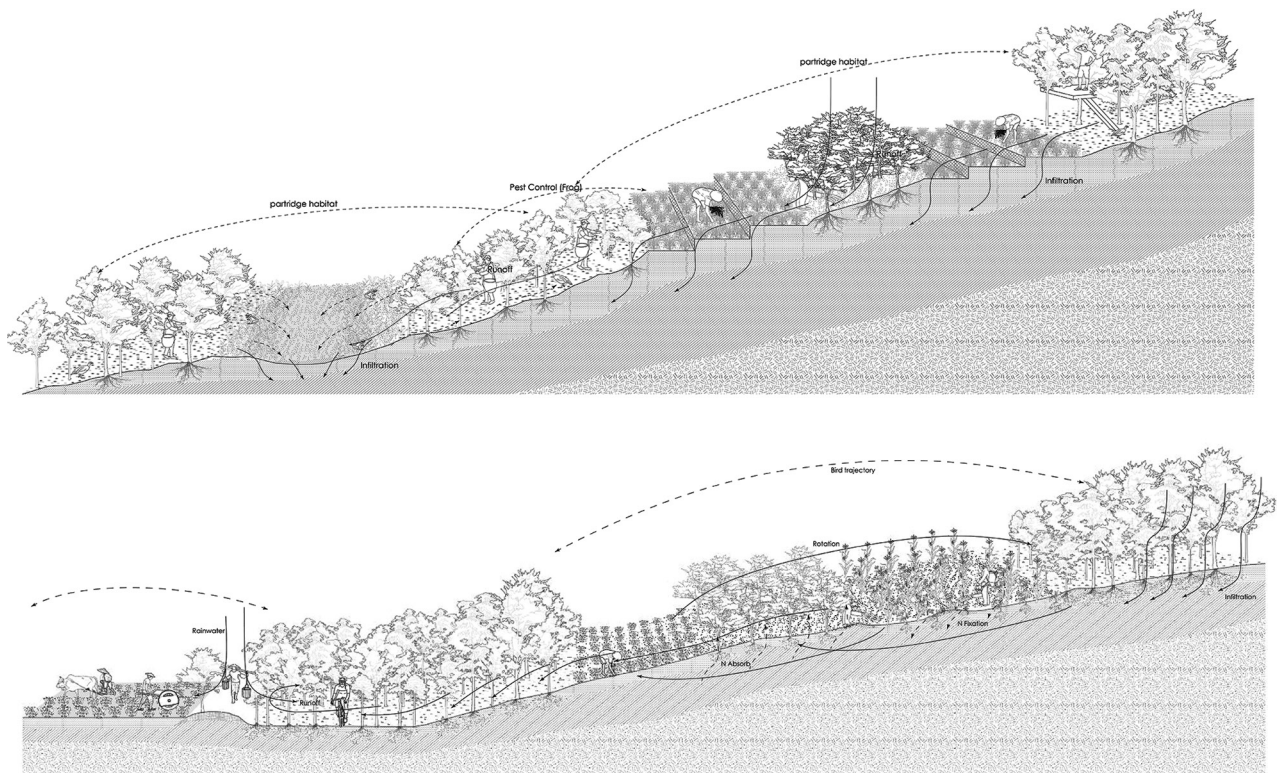


Figure 13. Proposed slope area section. Source: Drawings by the authors



Figure 14. The participation of villagers in constructing the wetland area. (A) Rain season. (B) Dry season. Source: Photo combinations by the authors

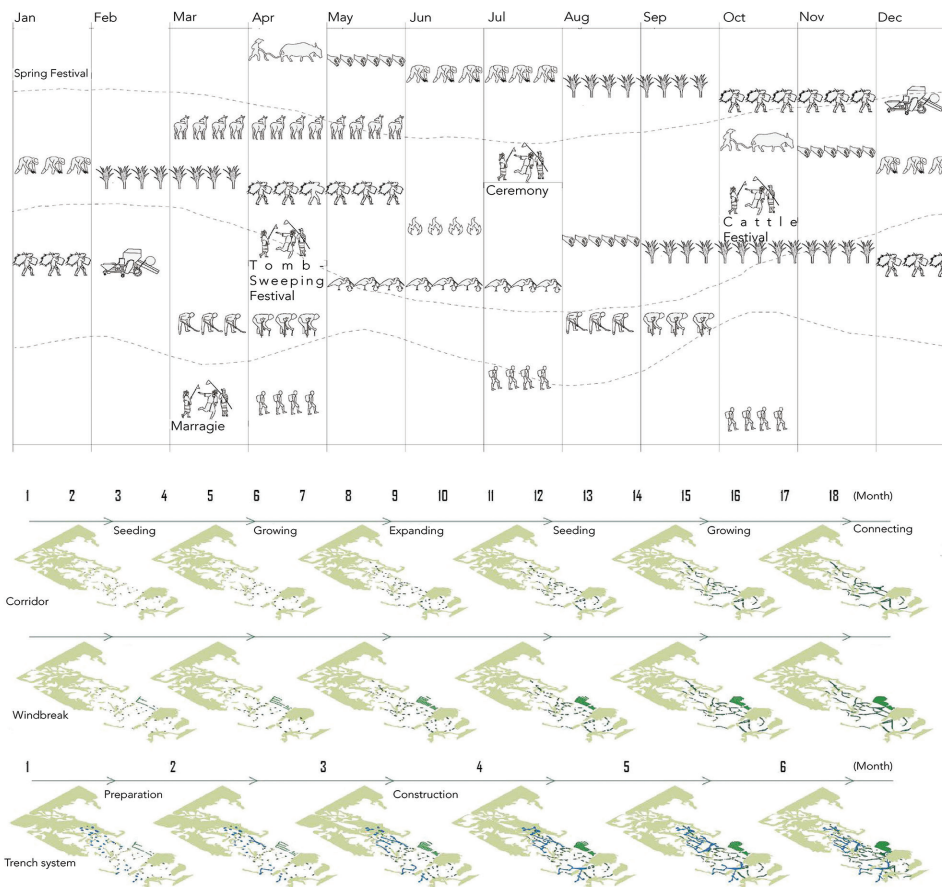


Figure 15. Proposed construction schedule of green infrastructure. Source: Drawings by the authors

The outcomes of the design research, relying on low-funded community involvement, would be implemented incrementally. The first phase begins by delineating the extent of the potential ecological corridor’s ribbon area. These ribbon spaces allow villagers to plant at intervals to

form clusters of small patches, which become habitats for native animals. Native animals forage for food in the patches and spread plant seeds through feces to the space beyond the patches, realizing the gradual expansion of the patches and connecting them to each other to form the corridor

space. Species in the patches and corridors compete freely to improve and stabilize the ecosystem. The ecological ribbons also leverage residents' traditional knowledge of plant use and experience in ditch construction. The mountain soil excavated for the ditch system and the agricultural straw produced by regular farming during this phase could be temporarily stockpiled to be used as raw materials for the second phase of implementation.

The next phase focuses on creating mangrove ecosystems along the riverbanks. By this point, the density of vegetation in the ditches and corridors has increased through the autonomous spread of plants and animals. Mountain soils, agricultural residues, sediments carried by the ditch system, and materials hoarded and decomposed in the first phase become the raw material for shaping the topography of the riparian wetland system and serve as fertilizer for soil restoration. This phase also provides additional work opportunities for villagers during their agricultural downtime (Figure 14).

The staged construction approach allows the ecosystem of the entire area sufficient time for viability and self-improvement, minimizing the loss in the income stream of the residents throughout the implementation cycle. The incremental phasing would closely reintegrate the daily activities and labor of local residents with the natural environment, revitalizing the traditionally close relationship between Li family's agriculture and local ecosystems. By participating in the process of ecosystem creation, the often-overlooked value of the villagers' traditional agricultural beliefs and practices is effectively realized. This model reduces the costs and total carbon emissions of the implementation process and allows for the recycling of agricultural resources (Figure 15).

3.2. Economic possibilities arising from a revitalized Li family's agriculture

The design of green infrastructure that incorporates traditional Li family's agricultural practices offers possibilities for eco-agriculture, eco-finance, and cultural tourism in Yulong Village. Once the ecological network of the entire Yulong Village has been virtually completed and the new rural green infrastructure landscape is essentially in place, tourist and visitor infrastructure could be added. Cycling routes within the existing road network could be installed. The topography affords places for viewing platforms, offering excellent outlooks of the landscape without disturbing the everyday lives and production activities of the villagers. On the cycling route, tourists could observe the landscape during the Li villagers' harvest season, watch cattle treading and aerating the fields, witness harvest-gathering activities, and experience other traditional Li family's agricultural activities. At different viewing platforms, tourists will have the opportunity to enjoy the landscape beauty of Yulong Village's sloping Shanlan rice terraces and smell the unique aroma emitted from the mountain orchid rice. Walking through the streets of Yulong Village, visitors can encounter Li women weaving in front of their houses and courtyards, wander among the poultry and animals walking along the streets, and hear the chirping of birds and insects attracted by the green infrastructure system. In such a landscape space, the residents of Yulong Village themselves are a living embodiment of the continued vitality of traditional Li family's agriculture and engage in its active dissemination through acts of sharing rather than performance. Tourists visiting Yulong Village would gain a better insight into authentic Li family's traditional culture compared to tourist attractions that rely on



Figure 16. Tourism experience in Yulong village. Source: Photo combinations by the authors

artificial reconstructions and performances created exclusively for tourist entertainment.

The outputs from the ecocultural systems offer additional economic possibilities. Although the cultivation of Shanlan rice on the slopes will be limited, it offers unique food and wine production. Compared to mass-produced commodities, these products might become high-value-added ecoagricultural items. The vegetation corridor system will also provide sufficient raw materials for the traditional textile and tie-dyeing crafts of the Li people, offering potential sales for handmade fabric and clothing products crafted from natural and ecological sources. Sustainably harvested rosewood in the vegetation corridor not only can provide value to the ecosystem but could also be harvested sustainably to generate additional profits for the residents of Yulong Village. The economic diversification brought about by green infrastructure improves the ecological security of Yulong Village. The residents' agricultural production activities may become less precarious, and they may remain stable sources of income, reducing the incentives to over-exploit land resources for short-term gains (Figure 16).

4. Discussion

The study found that in contrast to modern worldviews founded on Enlightenment humanism and Western scientific processes, the Li family's farming tradition in Hainan, China derives knowledge from perceptual understanding and reverence for their natural environment. This knowledge, characterized by a conscious nature-based practicum and spiritual mystique, has given rise to traditional values emphasizing the conservation of natural resources and a labor ethic of moderation. These values have enabled the Li people of Yulong to foster a long-term and stable coexistence with their landscape. However, these ideas, often absent in modern societies focused on productivity and wealth, have been transformed by industrial agriculture in the Li village environment. While new agricultural technologies bring beneficial efficiencies, they also leave a legacy of ecological and environmental erosion. Only a few remnants of vernacular life in Yulong Village and its agricultural fields have remained.

This design research has explored Li family's farming traditions and applied the theory and practices of green infrastructure – a greening paradigm usually deployed in cities and parklands – to discover potential avenues for restoring ecological vitality and human connectivity to the environment of Yulong Village. Drawing inspirations from urban models of green infrastructural practices, this research highlights the potential of implementing nature-based solutions, such as systematic water management

and diversified plant corridors, within and between areas of industrialized agricultural production. This approach aims not only to retain agricultural efficiencies but also to contribute greatly to the preservation of the Li family's farming culture. Green infrastructural practices in cities demonstrate that it is neither possible nor necessary to fully restore the landscape to its pre-modern state or return people to pre-modern ways of production and living. Similarly, in the Li villages' rural environment, green infrastructure landscape design could underpin the ecologically and economically sustainable development of Yulong Village. Green infrastructure has the potential to realize the mutual support and promotion of ecological security, cultural heritage, and economic development in Li villages. The projection is that this implementation will re-establish the traditional cultural space of the Li people, thereby reinforcing the connection between people and landscape.

Fundamental to our study on new approaches to green infrastructure design and the communication of tradition through new cartographies is the integration of morphological landscape design processes and field studies. MacHarg's layering design method, combined with other advanced cartographic technologies, spatializes a top-down view of the restoration. Field study mapping captures the narrative of village residents' culture. Instead of relying on a government edict, the society's active involvement in the implementation process of a bottom-up green infrastructure strategy would be essential to empower villagers to participate in the design and creation of green infrastructure. This approach will not only meet the actual needs of the Li residents but also leverage their practical knowledge of plant collection, soil care, Shanlan rice cultivation, and water management to inform this rural green infrastructure.

While this approach to green infrastructure design appears to be a potential method for rural revitalization, it must be acknowledged that rural revitalization is still in the exploratory stage. In reality, it faces challenges such as the ambiguous definition of stakeholders' rights and insufficient financial subsidies from local governments due to the uncertainty of relevant policies and legislation. In addition, there is still a considerable amount of traditional Li family's farming culture that deserves further study, such as Li family legends, stories, and music, which have the potential to provide important references and inspirations for the design of green infrastructure in the Li villages. More accurate geographic information collection of the Li villages and more in-depth sociological surveys could improve the precision of the morphology design of the Li family's green infrastructure. Establishing a more effective consultation and communication platform with the Li residents to realize a more sophisticated participatory

design and construction model will also be an important direction for future research. To be consistent with the holistic nature of Li family's farming traditions, the upgrading of the existing residential facilities in the Li villages should also be included in the design of future green infrastructural network. While this research offers promising conclusions for the longevity of Li family's agricultural tradition and a more sustainable environment in Hainan, future landscape design for rural revitalization needs to conduct in-depth interdisciplinary research with related disciplines, such as law, economics, and politics. Such exploration will contribute to the improvement of China's rural revitalization policies and legislation, providing a top-down assurance for the on-ground practice of green infrastructure.

5. Conclusion

After nearly a century of modernization, China has indeed achieved remarkable success in eradicating rural poverty. However, it now confronts the even more arduous task of transforming its ecological civilization and revitalizing the countryside. This endeavor entails not only the need to apply more scientific and efficient modern approaches to rural governance but also the need to infuse new connotations into China's ancient agrarian civilization, thereby nurturing China's spiritual civilization. Li family's agriculture is an important part of China's farming culture, serving as a crystallization of wisdom passed down from generation to generation by the Li people. The significance of Li family's traditional farming culture and vernacular culture, therefore, extends far beyond their immediate context, bearing extraordinary significance in the construction of China's ecological theory and the discourse of China's ecological civilization. The practice of green infrastructure will play a key role in reshaping the implementation of ecological civilization. In conclusion, we assert that Chinese landscape architects have an obligation to help protect and promote traditional Chinese culture in the process of global cultural integration and impact. They play a key role in building up cultural self-confidence for the Chinese people and conveying to the world a different story of modernization.

Acknowledgments

None.

Funding

None.

Conflict of interest

The authors declare that they have no competing interests.

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Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Availability of data

The data that support the findings of this study are available on request from the author Keshen Wu on reasonable request.

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