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**Rice Terrace Farming Systems**  
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# Overview of Rice Terrace Farming Systems in Hani and Ifugao: Water Management and Current Threats

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## **Rice Terrace Farming Systems**

This working paper series share findings produced as part of the research activities under the Rice Terrace Systems in Rural Asia, a research project of the United Nations University Institute for the Advanced Study of Sustainability (UNU-IAS). The project aims to address dual challenges of both excessive runoff and water scarcity due to climate change by providing ecosystem based adaptation measures to strengthen resilience of the Hani Rice Terraces and Ifugao Rice Terraces.

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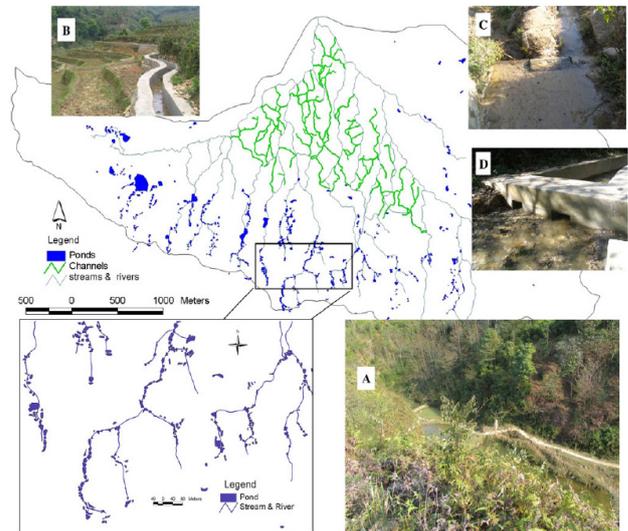
## Water Management Systems: Hani and Ifugao

Water management systems in Hani and Ifugao rice terraces have developed over the centuries to cope with variations in the water supply due to seasonal and annual rainfall changes. The Hani have managed water, forests and soil based on principles of environmental sustainability that are embedded within the Hani socio-cultural system of moral codes and obligations. In the Quanfuzhuang watershed (Figure 1) for example, mountain forests on the slopes above the terraces cover an area of 7.84 km<sup>2</sup>, and are protected as a water conservation and collection region. Most of the water conserved by the forests is collected in mountain streams and stored in 1,639 ponds distributed among the valleys (Figure 1.a). The river valleys are also used as natural irrigation and drainage channels during irrigation periods. Some of the up-stream runoff is diverted directly into the terraces, and some of the rest is diverted to the villages for daily water consumption. A complex network of irrigation channels has been constructed between terraces to deliver water efficiently and swiftly (Figure 1.b). To manage the irrigation channels and allocate the water resources effectively among the villagers, the Hani have developed an efficient water-allocation system based on the use of carved wooden barriers (and now, concrete barriers) (Figure 1.c&1.d). Community ownership of water rights and the irrigation infrastructure encourages a harmonious partnership among the villagers. When water use conflicts arise, they are resolved based on a set of rules and regulations that govern canal construction and maintenance and water distribution and management. The whole community is involved in building the irrigation system. Traditional carved wooden barriers or more modern concrete barriers of different heights, called *ede* in the Hani dialect, are positioned so farmers can allocate the proper flow of water to each terrace.

The Ifugao Province is located at the center of North Luzon Philippines in the mountain range of the Cordillera region with a unique sustainable and traditional mode of agriculture. The province, which has Lagawe as its capital borders Benguet and Isabela to the west and east respectively covers a total land of 2,628.2km<sup>2</sup> (Jang and Salcedo, 2013). It is the most famous in the Philippines because of its rice terraces, which are cultivated below *Muyong* forests (Jang and Salcedo, 2013). The rice terraces are deeply intertwined with the indigenous culture and ecology of mountainous areas and were designated as world heritage site by UNESCO in 1995. The water management system in Ifugao rice terraces has used the concept of a "water district", each water district has its own agricultural leader and workgroup. The workgroup is organized for the construction and maintenance of irrigation canals. The Ifugao develop intricate irrigation and drainage systems for their rice terraces. The water is gradually released into the paddies by using bamboo or log flumes. The Ifugao people have been the custodi-

ans of both forests and rice terraces. However, sustainable management of the forest within the area has been a great challenge for the Ifugao communities and several strategies and policies have been put in place to enhance and promote community forestry (Kawasaki, 2012).

**Figure 1: Irrigation system of the Hani in the upper reaches of Malizhai River Basin**

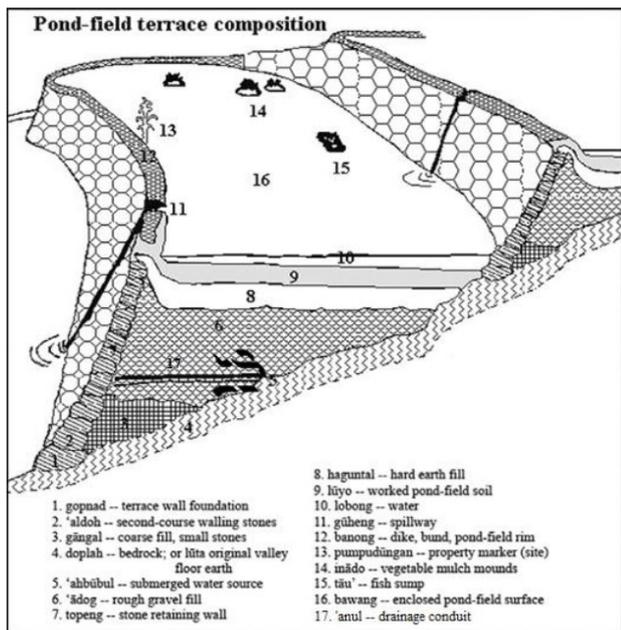


The indigenous peoples of the Philippine Cordilleras master the conservation agriculture techniques in the construction and continuance of the rice terraces system. This system includes a complex of coordinated parts such terraced ponds (*payo*), the village (*boble*), swidden farms (*uma*) and forests (*muyong*) (Figure 2). They increase maximum capacity of the land so that each part functions as a complement to the others and a vital part to the whole (Martin, 2013). The custodians of this outstanding complex value system of rice terraces have explored various ways of coping with their harsh environment. Their struggle for existence has created a unique landscape and at the same time, an attendant lifestyle that is distinctive. This synergy of the hearts, minds and souls of a people is reflected in the indigenous knowledge systems and practices of the Ifugao Rice Terraces (SITMo, 2008).

Martin (2013) described various science and indigenous knowledge in this unique globally important agricultural system. Soil and water conservation technology of the Ifugao through use of irrigation and bench terracing engineering principles by Ifugaos of old exemplifies the ancients' mastery of the natural forces and his environment. Sourcing water from streams and rivers near and far through a complex of canals, ditches and bamboo channels and with extensive knowledge of weather patterns, water behavior and soil consistency enabled the Ifugao to develop a body of indigenous practices in coping with the challenges in their environment. To maximize capacity of land and good harvest, intercropping techniques using a mix of rice, vegetables and root crops and the growing of fish, edible mollusks and other protein sources in the pond fields, have assisted Ifugao farm-

ers in ensuring a sustainable diet source of food on their tables.

**Figure 2: The cross section of a typical Ifugao Pond field**  
(Conklin, 1980)



Managed forests of the Ifugao serve as watersheds for the Ifugao rice terraces and serve as supplementary food source particularly that of *muyong*. The Ifugao's *muyong* system stands out among indigenous silviculture, horticulture and soil and water conservation methods. The Ifugaos successfully practiced assisted natural regeneration (ANR) system long before its recognition in the forestry sector as a strategy for forest regeneration in ensuring sustainable water supply for the rice fields. In a study by the MSc students of UNU-IAS in 2014, most farmer respondents emphasized that they consider *muyong* very important in their existence and argue that sustainability of rice terraces and water supply depends on effective management of forest. Majority of the respondents ranked *muyong* as extremely important in their lives and interestingly, 83% listed *muyong* as extremely important to the sustainability and continuity of the rice terraces.

Ifugao rice terrace communities revolve around their complex, dynamic and adaptable rice terrace systems, which are underpinned by scientific mastery, social and cultural heritage, and spiritual understandings all of whose physical, social, cultural, economic and spiritual dimensions are interdependent and inseparable. However, having endured tremendous challenges over many centuries, they are now confronting a combination of systemic changes and challenges unprecedented in nature or scope, all interconnected in their drivers and impacts. Nonetheless, the communities have been developing a rigorous awareness of these circumstances, and are engaged in active efforts to overcome, absorb or adapt to them, under organized community leadership and direction – the

latest examples, indeed, in Ifugao's venerable tradition of adaptation and resilience.

### Current Challenges and Threats to the Rice Terraces and its Communities

Some complex combination of challenges now confront the survival of the rice terraces and its communities. Various forces that affect the values, and create pressures as well as opportunities that are usually driven not only by climate changes but more importantly, driven by socio-economic factors affect not only the physical systems but the social dynamics in rice terrace communities that are central in the sustainability and continuity of rice terrace systems. These common forces both in Hani and Ifugao include climate change, the rise of tourism following promotion of the terraces as a tourist destination, and associated socio-economic changes such as in income opportunities or cultivation patterns, as well as the more general changes in values, pressures or opportunities associated with globalization.

The current threats to Hani rice terraces are rooted in economic motives pursued through tourism promotion and its associated social changes. To maintain a steady flow of tourist income, local authorities and land managers have started to widely adopt an agriculture system called "pushing grain for water," which has encouraged the retention of water in the upstream villages and reduced the supply of water for rice cultivation in the downstream villages, leading to an expansion of maize cultivation. Apart from this, climate change is also creating new risks as terraces are increasingly susceptible to water shortages and drought during the dry season. To explore the viability of local, economically-based models to address shortfalls in ecological and social sustainability of current rice terrace land management trends.

The ecological challenges include disruption of the former coordination between the human landscape and the natural environment and disregard for communal norms through commodification of Hani culture and environmental products including sacred places. Current social challenges are changing intergenerational values from sacred forest landscapes to 'modernised' values and preferences for land use driven by livelihood maintenance over cultural/aesthetic/environmental values. Most importantly are the current economic challenges that need to be addressed such as the introduction of an alternative, more profitable products (tourism) without meaningful integration of existing economic factors such as labour supply or rice productivity and structural change in the economy through the introduction and promotion of tourism and consequently diminished overall aggregate supply and demand of agricultural products.

The descended traditional ecological knowledge and its maintenance systems in the Ifugao rice terraces are fac-

ing significant threats and challenges from social and natural factors, which directly resulted enlisting IRT in "The List of World Heritage in Danger" by UNESCO in 2001. These problems demand adaptation and coping strategies (Droogers, 2004), and presents new challenges for the management of the environment and agroecosystems in Ifugao. Ifugao rice terrace systems and its communities are facing unprecedented and complex combination of challenges, originating from far more comprehensively global phenomena than any in the past.

Chaobang (2013) summarized some local perspectives on the current challenges that are affecting the sustainability of the Ifugao rice terrace systems and its communities such as impacts of introduction of new rice varieties; the abandonment of rice terraces; climate change and associated physical challenges; cultural erosion; and booming tourism demands. The introduction of new rice varieties in the 1960s and 70s caused deep structural changes to the rice terrace systems and has generated lasting pressures ever since. This overlooked the unsuitability of lowland rice to Ifugao's cooler highland climate; its poorer nutrition and taste according to locals; its dependence on artificial fertilizers and pesticides which seriously damaged local ecosystems and wiped out indigenous bird and fish species; the reliance it created on powerful commercial interests producing those materials; and its incompatibility with Ifugao rituals due to its lack of spiritual significance and different cultivation cycle, causing much cultural and logistical disruption.

With the assimilation of the Ifugao into state system and market economy, the perception of the Ifugao on the value of their heritage seems to be changing, oftentimes leading to out-migration especially of the youth in search of better opportunities or higher income that do not require heavy physical work such as that required to maintain the terraces. Increasing irregularity and unpredictability in Ifugao's weather and climate patterns has also been observed, causing physical changes in the systems and equally demand further adaptation in farming practices. Quite crucial to all these is the erosion of Ifugao cultural and spiritual heritage. Though that current has been checked by renewed concern to preserve this heritage, helped by its UNESCO World Heritage recognition, it now faces a perfect storm of pressures from the introduction of lowland rice, the replacement of rituals with imported technology, the supplanting of traditional institutions with national ones, and a growing materialism that has weakened interest in cultural maintenance. Like Hani, tourism has also become a complex and highly influential new phenomenon in Ifugao life in recent decades. Limited tourism income reaching actual farmers, abandonment of rice terraces due to the greater profitability of tourism industry work, physical damage to the terraces by tourists, and the commodification of rituals, artifacts and cultural expressions integral to the terrace systems' function are the major concerns related to the booming tourism demands.

## Conclusion

In quest for sustainability of the system and its communities, long term plans and strategies should ensure sustainability not only of the physical but also intangible aspects of these complex heritage agricultural heritage systems. The rice terrace systems' complexity can be appreciated by looking at the network of ways underlying the lifestyle of its people. It is in the context of this complexity that Hani's and Ifugao's present-day socio-economic challenges, and the responses to them, must be understood. In the first instance they are valued by local people as a paramount expression of their identity and cultural heritage, representing people's interdependence with the environment. These heritage site's social and cultural content – ethical values, spiritual beliefs and practices, social obligations, art and aesthetics – further supports the rice terrace systems. These many dimensions are not separated into discrete fields or disciplines as has become standard in globalized culture, but rather blend together in an inseparable, interdependent whole that underpins the Hani and Ifugao's way of life.

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