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## Role of Rice Terraces in Japan



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### ABSTRACT

Rice terraces are rice-cultivation areas (paddy fields used to grow rice) on steep slopes. In places where it is difficult to secure a large area for cultivation on flat land (places with little slope), small areas of flat land are created on steep slopes and used as rice fields to promote rice cultivation. In this article, we discuss the history of rice terraces and their significance in Japan and overseas, and consider whether they should be retained.



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## INTRODUCTION

Rice terraces are rice cultivation areas (paddy fields used for rice cultivation) located on steep slopes<sup>1,2</sup>). According to the Ministry of Agriculture, Forestry and Fisheries, rice terraces are defined as rice fields with a slope of 1/20 or higher (a slope with 1 meter difference in height for every 20 meters of horizontal distance). In places where it is difficult to secure a large cultivated area on flat land (places with little slope), terraced rice fields are created by creating small areas of flat land on steep slopes to be used as rice fields to promote rice cultivation. Rice fields that have been kept horizontal because of land leveling are regularly accumulated, and if there are many (multiple fields), they are called Senmaida (terraced rice field; literally translated, it means 1,000 rice fields; even if there are not 1,000 fields, several fields qualify for this title). Similar to rice terraces, fields built with stairs on a slope (to produce vegetables and fruits) are called terraced fields<sup>3</sup>).

In general, it is considered better for rice-growing land to have a slight slope (gentler than that defined by the Ministry of Agriculture, Forestry and Fisheries). Suitable land for rice cultivation in Japan is land that not only provides stable water access rights (the right to exclusive and continuous use of running water), but also allows easy management and control of flowing agricultural water. It is natural for most land to have some degree of slope (even if it is not the same as defined above). Land with too little slope does not allow water to flow, and stagnant water results in wetlands where the roots of plants such as rice are prone to rot; the water itself is prone to rot and become contaminated. A certain degree of slope is necessary if irrigation (artificial supply of water to farmland) and drainage can be performed without incurring costs or effort. Therefore, areas with too little slope are considered unsuitable for rice cultivation. Natural rather than artificial slopes are also important for eliminating conflicts over water access rights between farmers. When water for rice cultivation is introduced from a river, if it only remains in a certain rice field, other people cannot use it. For this reason, it is desirable that river water does not stay in one place but flows into various places (such as multiple fields). Land suitable for rice cultivation that uses the natural topography (one that does not rely on water supply from electric pumps or pumping water from wells) has slight differences in elevation. The ideal locations are the middle and upper reaches of rivers with clear slopes between rice fields (where water can easily move between multiple rice fields). If there are slopes, many rice-growing areas can be

considered rice terraces in a broad sense (although they deviate from the strict definition set by the Ministry of Agriculture, Forestry and Fisheries).

Rice terraces, together with Satoyama, represent the original landscape of Japan<sup>4),5)</sup>. In this paper, we focus on the rice terraces clearly located on steep slopes. In addition to touching on the history of rice terraces, we introduce the significance of rice terraces in Japan and overseas, and consider whether they should be preserved<sup>6)</sup>.

### *History of rice terraces*

The documented history of rice terraces in Japan can be traced back to a document published in 1406, in which the term rice terraces is found. Irrigation technology has improved since the early modern period, and it has become possible to install waterwheels in canals for irrigation and drainage, even on plains with little slope. Rice cultivation has spread in the downstream areas of rivers, which are now called granaries. The ideal location for a fishing port was often an inlet surrounded by mountains along the coast. For this reason, in fishing villages that were not located on flat land and were far from the fishing ports, rice fields were mostly built on mountains (on slopes) near the fishing port to cater to the fishermen's staple food.

After World War II (starting around the 1950s), large-scale and mechanized rice cultivation was promoted, and large rectangular rice fields, where it was easy to install agricultural machinery, were uniformly maintained. Rice cultivation continued based on the introduction of large machinery and improvements in efficiency, before considering the characteristics of the land. This type of maintenance and mechanization was particularly difficult in areas with steep slopes. However, advances in civil engineering technology have successfully expanded the scale of rice terraces in many mountainous areas. If rice terraces with steep slopes are to be expanded to a larger scale, the slope must be significantly reduced to flatten them. This incurs enormous costs for incidental construction work such as landslide prevention measures on slopes (artificial slopes made by cutting or embanking). Therefore, some areas did not expand to a larger scale or were abandoned, resulting in some areas falling into disrepair.

Irrigation is necessary for rice cultivation; therefore, even the steeply sloping rice terraces that remain today are equipped with river water irrigation facilities. In mountainous areas, nearby rivers are in the upper reaches, and if drought continues, the amount of water can reduce

considerable, causing rice fields to dry up. Thus, either long irrigation canals from sources other than the nearest river were constructed or rain-fed irrigation was used by constructing reservoirs (rain-fed irrigation is a method of managing rainfall water and drawing water to the fields; this method uses both irrigation and rain water). In places where these methods are difficult, underground holes are drilled in rice fields, and groundwater, such as spring water or underground water, may be used. Hence, the preservation of rice terraces was once considered a measure to address the aging population and lack of successors in agriculture<sup>7)</sup> (this may be contradictory to the later discussion). In addition to the income from rice cultivation, supplementary income was expected from tourism by having people visit and experience the areas and buy souvenirs. However, it is difficult to control tourist interests and trends, and profitability is unstable. As the population in Japan continues to age, it will become difficult to care for rice terraces, and despite their significance, it may not be possible to maintain them<sup>8)</sup> because rice terraces require approximately twice as much labor as rice fields on flat lands; and, despite hard labor, the rice yield is less than 60%<sup>9)</sup>.

Rice terraces have other disadvantages in terms of labor productivity compared with low-lying rice fields<sup>6)</sup>. Rice terraces have small cultivated areas per paddy field, making it difficult to introduce large agricultural machinery. However, it may also be possible to introduce small amounts of agricultural machinery by building paved roads to or between rice terraces. Villages on flatlands have the same climate; therefore, the same farming tasks overlap, making it difficult to share agricultural machinery across the entire village. Rice terraces have different temperatures and sunlight hours at the top and bottom of the mountain, resulting in differences in crop growth and shifts in farming seasons. This makes it easier to share agricultural machinery compared to villages in flatlands. If this is taken advantage of, rice terraces have the potential to improve labor productivity.

### ***Role of rice terraces in Japan***

Rice terraces are valued for their multifaceted nature, including the preservation of national land and beautiful landscapes, maintenance of rural communities, and interaction with cities, culture, and education. They are valued for purposes other than rice cultivation and are distinct from ordinary rice fields whose purpose is to harvest rice. In 1999, the Ministry of Agriculture, Forestry and Fisheries selected 134 districts across Japan as the top 100 Rice Terraces in Japan.

In 2022, 271 districts were announced as Connected Rice Terrace Heritage Sites in which various actors, including local governments, participated in their maintenance and promotion (Table 1). These sites were selected based on their evaluation of the landscape and maintenance activities. As of 1993, rice terraces in Japan accounted for approximately 8% of the total rice field area, indicating that they are a common type of rice fields<sup>10</sup>. During the same period, 12% of the rice terraces were abandoned for cultivation, and the abandonment rate is expected to increase over time (Table 2). Since 2019, the Japanese government has supported farming and has promoted the continuation of rice terraces through the enactment of the Rice Terrace Area Promotion Act (Table 3) because the Japanese government values the historical significance and tourism potential of the rice terraces. Subsidies are currently being provided to rice terraces certified by the Ministry of Agriculture, Forestry and Fisheries.

Rice terraces are located on slopes and are difficult to work with; however, because of their high drainage capacity, they are used not only for rice cultivation, but also for cultivating high-value-added commercial crops, such as wasabi<sup>3</sup>. Rice fields located on steep slopes have fast water flow and little stagnation, making the water less likely to become contaminated, making it suitable for crops that require clear water to grow. There are also examples of branded products that highlight the fact that rice is harvested from rice terraces. Flowers and other plants planted on fallow farmlands for people to enjoy are called landscape crops. Planting cherry trees and other plants on rice terraces is being attempted all over the country. Famous landscape crops include cosmos, rape blossoms, and sunflowers, and viewing them is sometimes the main purpose of tourism<sup>1</sup>.

Many regions have introduced ownership systems to maintain the landscape of their rice terraces or increase the number of repeat visitors as tourist destinations<sup>1,11</sup>. The term rice terraces began to be used frequently in Yusuhara town, Kochi in 1992<sup>6,9</sup>. The ownership system is for a limited period and applicants do not purchase farmland outright, convert farmers into tenants, or change jobs. Because it is a legal problem for non-farmers to acquire farmland, ownership is only in name, and there are no real estate transactions. In other words, the ownership system is equivalent to options trading, and can increase supplementary income for villagers and hedge risks in rice cultivation. The owner only pays to rent the rice terraces and occasionally comes to take care of it; most of the care is taken by the farmers who are the original owners of the rice

terraces (effectively, they also earn labor costs for this purpose). This allows farmers to secure supplementary income other than rice production<sup>11)</sup>. Many farmers who own rice terraces often make a living as part-time farmers<sup>1)</sup> because of low and unstable incomes. Owing to the declining birthrate, there are fewer successors to rice cultivation in the rice terraces, and the increasing number of elderly people is making it further difficult to take care of these terraces; therefore, an increasing number of rice terraces are being abandoned. Many rice terraces have been abandoned because it is difficult to improve the efficiency of farming<sup>1)</sup> (there are reports that 20-30% were abandoned<sup>9)</sup>). Rice terraces cannot be expected to generate a large income from rice cultivation alone; cultivation is only an act of securing rice for home consumption, extending a hobby, or maintaining traditional culture<sup>6)</sup>. However, it has become difficult to use abandoned rice terraces for other purposes. Since 1999, the Ministry of Agriculture, Forestry and Fisheries has recognized Japan's top 100 Rice Terraces, and being selected as one of the top 100 in Japan may lead local communities with rice terraces to undertake redevelopment efforts. It may be possible for rice terraces to continue if they are used for tourism purposes, such as inviting camping in the rice fields after rice harvesting<sup>12)</sup>. Both the government and the farmers want the rice terraces to continue, but it will be economically difficult for them to survive unless they succeed in tourism.

The availability of manpower through the ownership system is limited, and day-to-day management is the responsibility of local residents (in some cases, volunteers). There have also been cases in which rice terraces were forced to continue to be maintained to ensure the survival of the village. In areas where the population is aging, each person's workforce is decreasing, making maintenance activities impossible without increasing the number of workers (if one person can only do the work of 0.5 people, they will need to hire twice as many people<sup>1)</sup>).

### ***Rice terraces overseas***

There are rice terraces not only in Japan but also overseas<sup>3)</sup>, in other Asian regions, the most famous of which are the three rice terraces registered as UNESCO World Heritage Sites. One is the Red River Hani Rice Terraces in southern China's Yunnan Province, known as the world's largest rice terraces<sup>13)</sup>. These rice terraces were created over 1,300 years ago by the Hani ethnic minority, and boast an overwhelming size, with approximately 3,000 steps and an elevation difference of 500 meters. Many tourists flock here in search of spectacular scenery, including the



mirror-like shine of water in the rice fields and the sea of clouds at dawn. Second, the Cordillera rice terraces in the northern part of Luzon Island in the Philippines are magnificent rice terraces known as the Stairway to Heaven<sup>14)</sup>. It took over 2,000 years for the Ifugao ethnic minority to create them, and the total length of the rice terraces is said to be 20,000 km, equivalent to half the circumference of the earth. In Bali, Indonesia, a popular resort destination has rice terraces called Jatilui Rice Terraces<sup>15)</sup>, which are based on an irrigation system grounded in Hindu philosophy that has been passed down since the 9th century (Subak, a traditional irrigation association found in Bali). Similar to the rice terraces in Japan, these places also need to be preserved culturally. However, unlike Japan, harvesting crops is the main goal for farmers who live economically independent lives based on their harvests. It is rare for them to shift to tourism and activities other than rice cultivation, such as ownership systems and landscape crops, to make their livelihoods the primary focus of their lives. There are times when tourists go there to enjoy the scenery, but unlike in Japan, rice terraces are not maintained primarily for tourism without concern for yield.

## CONCLUSION

Rice terraces once contributed to food self-sufficiency in mountainous and coastal areas with few plains, and today, along with Satoyama, they play a major role in preserving the landscapes and biodiversity<sup>5)</sup>. Especially in Japan, with surplus rice production and increase in food transportation efficiency, there are an increasing number of cases in which rice cultivation is abandoned because of low labor productivity. Efforts to specifically conserve terraced rice fields, such as branding rice cultivated on rice terraces, introducing ownership systems, mechanizing, and converting rice to landscape crops, are being explored in various regions. These are not primarily intended for rice production through rice cultivation but rather for tourism purposes.

Contrarily, rice terraces in Japan have become hometowns (the land where one was born and raised) and original landscapes (a landscape that reminds one of the experiences that greatly influenced the formation of ideas). When tourists visit these rice terraces, they not only remember their past, but may also imagine their future. Thus, rice terraces have a mysterious charm that fills the viewer with a sense of nostalgia and makes them feel like a light is shining on tomorrow. Because of these characteristics, they have become attractive tourist destinations. This sensibility is shared not only by the Japanese people, but also foreigners, making them attractive

places for foreign tourists in recent years. Hence, the legacy of rice terraces should be preserved for the future. Keeping it culturally alive is also beneficial for the tourism industry and economics. However, their sustenance and development will depend on people's awareness of rice terraces, maintenance of landscapes including rice terraces, and creation of new attractions. Unfortunately, people seek newness and become tired of the old things; therefore, the government and farmers need to continue to maintain their novelty and appeal.

As shown in Table 1, these rice terraces exist all over Japan, being maintained and developed, competing for tourists. Under such circumstances, it may be difficult for them to survive unless there is a special landscape or charm to maintain and develop. The government and local governments may believe that instead of focusing on too many rice terraces, it would be better to focus on a few areas and increase their value. This can be said because the authors are neither farmers nor people who maintain the rice terraces.

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Table 1. Top 100 rice terraces in Japan

Region	Prefecture	Number of rice terraces	Main cities, towns, and villages	Main rice terrace names
Tohoku	Iwate	1	Ichinoseki	Yamabuki
	Miyagi	2	Marumori, Kurihara	Sawajiri, Nishiyama
	Yamagata	3	Asahi, Yamabe, Ohkura	Kunugidaira, Ohwarabi, Shikamura-no-tanada
Kanto	Tochigi	2	Mogi, Nasukarasuyama	Ishi-batake, Kunimi
	Chiba	1	Kamogawa	Ohyama-senmaida
Chubu	Nagano	16	Komoro, Ueda, Togo	Utsuboiri, Inakura, Himekozawa
	Shizuoka	5	Hamamatsu, Izu, Numadu	Kurumeki-no-tanada, Ohguriyasu-no-tanada, Arahara-no-tanada
	Niigata	7	Jyoetsu, Tokaichi, Kashiwazaki	Kamifunakura-no-tanada, Kitsuneduka-no-tanada, Hasuno-no-tanada
	Toyama	2	Himi, Toyama	Nagasaka, Minori
	Ishikawa	3	Tsubata, Shika, Wajima	Okuyamada, Ohsasanami-suiden, Shirayone-no-senmaida
	Fukui	2	Echizen, Takahama	Nashigadairachiku-senmaida, Hibiki
	Gifu	5	Gujyo, Yaotsu, Ena	Shogahora, Kamidaita, Sakaori
	Aichi	2	Shinjyo, Shitara	Yotsuya-senmaida, Nagae-no-tanada
Kinki	Mie	3	Kumano,	Maruyama-senmaida,

			Matsuzaka, Kameyama	Fukano-no-dandanda, Sakamoto
	Shiga	1	Takashima	Hatake-no-tanada
	Kyoto	2	Fukuchiyama, Kyotango	Kehara, Sodeshi
	Osaka	2	Chihayaakasaka, Nose	Shimoakasaka-no-tanada, Nagatani-no-tanada
	Hyogo	4	Taka, Sayo, Kabi	Isarigami, Otsuohkidani, Ueyama
	Nara	1	Asuka	Kannabi-no-sato (Inabuchi)
	Wakayama	1	Aritagawa	Arakijima
Chugoku	Tottori	2	Iwami, Wakazakura	Yokoo, Tsukuyone
	Shimane	7	Masuda, Unnan, Okuizumo	Nakagaachi, Sannoji, Ohharashin-den, Kandani
	Okayama	4	Kumeminami, Misaki	Kitasho, Kamimomi, Koyama
	Hiroshima	1	Akiohta	Ini
	Yamaguchi	1	Nagato	Higashiushiro-bata
Shikoku	Tokushima	2	Kamikatsu, Miyoshi	Kashihara-no-tanada, Shimokage
	Kagawa	1	Shodo	Nakayama-senmaida
	Ehime	3	Uchiko, Saiyo, Matsuno	Izumitani, Dohnosako, Okuuchi
	Kochi	1	Yusuhara	Senmaida
Kyushu	Fukuoka	4	Yame, Ukiha, Asakura	Hirouchi-Uebaruchiku- tanada, Tsudura-tanada, Shirakawa
	Saga	6	Karaki, Genkai, Arita	Warabino-no-tanada, Ohura- no-tanada, Hamanoura-no- tanada
	Nagasaki	6	Hasami, Matsuura, Kawatana	Oniki-tanada, Doya-tanada, Hinata-no-tanada
	Kumamoto	11	Ubuyama, Yatsushiro, Kamiamakusa	Ougi-tanada, Nichiko-no- tanada, Tenjinkoba-no-tanada
	Oita	6	Yufu, Beppu, Higoohno	Yufugawaokudume, Uchinari-tanada, Jikumaru
	Miyazaki	11	Ebino, Takachiho, Hinokage	Masaki-tanada, Oku-no-kuchi (Kamigami-no-sato), Tochimata
	Kagoshima	3	Wakimizu, Minamikyushu	Uchinoo, Kurinomachikouda- no-tanada, Tsukuda

Rice terraces exist in every prefecture of Japan, except Saitama, Tokyo, and Okinawa.

The Top 100 Rice Terraces were selected by the Ministry of Agriculture, Forestry and Fisheries, considering the scenery and conservation status of the rice terraces.

Tanada and Senmaida are Japanese names for rice terrace.

Suiden, Da, and Den refer to rice fields, whereas Hatake and Bata refer to fields.

Dandanda is thought to refer to terraced fields.

Based on data from Reference 16).

Table 2. Events in Japan regarding rice terraces

Year (Month)	Events
1988	Establishment of the definition of rice terraces (Ministry of Agriculture, Forestry and Fisheries)
1991	Establishment of a national rice terrace conservation organization
1992	Launch of rice terrace owner system
1995 (Sep.)	Holding the National Rice Terrace (Senmaida) Summit and establishing the National Rice Terrace (Senmaida) Liaison Council
1995 (Dec.)	Establishment of rice terrace network
1999 (Jul.)	Selected 100 best rice terraces (Ministry of Agriculture, Forestry and Fisheries)
1999 (Aug.)	Launch of the Rice Terrace Society
2002	Corporatization of rice terrace network
2019	Enforcement of the Rice Terrace Area Development Act (related ministries and agencies)
2022	Recruitment for the Top 100 Post Terraced Rice Fields (Ministry of Agriculture, Forestry and Fisheries), announcement of 271 districts for the Top 100 Rice Terraces (Local Governments)

Table 3. State of devastation of rice terraces in an area

Situation	2007		2017	
	Area (m <sup>2</sup> )	Ratio (%)	Area (m <sup>2</sup> )	Ratio (%)
Cultivated	33412	53.7	21355	34.3
Under management (uncultivated)	9544	15.3	-	-
Abandoned	19272	31.0	40873	65.7
Total	62228	100.0	62228	100.0

-: Not mentioned in the reference (considering the total area, it seems to be zero).

Area was measured via aerial photography.

*Cultivated* is land that is currently being cultivated; *Under management* is land that is not currently being cultivated but has not been abandoned; and *Abandoned* is a wasteland that is not currently being cultivated.

Based on data from Reference 17).

