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Changes in Terrace Structures and Soil Properties in Hani Paddy Terraces after Conversion to Upland Terraces

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Terraces are important practice to conserve soil and water in farming systems in mountain areas. Since the mid- 20th century, marginalization of farmland occurred worldwide in mountainous areas. Farmers reduced investment in terraced fields or even abandoned the fields, and induced negative ecological consequences that are widely concerned. Current studies about marginalization of terraces mainly focus on upland terraces. The understandings of the process of marginalization of paddy terraces and their impacts are limited. Hani Paddy Terraces are one of the Globally Important Agriculture Heritage Systems. However, many of the paddy terraces have changed into upland terraces due to lack of water, labor out-migration ect, which hindered the conservation of the heritage. Taking Amengkong River Basin in Yuanyang County in Southwestern China as the case study area, we explored the changes in terrace structure, productivity of top soil (0~20 cm) and the water holding capacity soil in 0~70 cm depth in Hani Paddy Terraces since conversion to upland terraces fields by 2~14 years. We found that (1) most ridges disappeared after conversion, the surface of fields were generally maintained in flat conditions, risers of terraces collapsed in varying degrees in more than 70% filed parcels. The degree of damages in terraces structures showed a U-shape curve along with time, as the pattern of drained by 2 years> drained by 3~4 years> drained by 10~14 years > drained by 5~9 years; (2) the soil productivity index increased after converted to upland terraces, and showed a trend of decreasing first and then increasing along with increasing years of conversion. (3) The water holding capacity of 0~70 cm soil dramatically decreased after conversion, and increasingly decreased along with increasing years of conversion. The maximum water holding capacity decreased by 9.16%~21.70% and the capillary volume decreased by 12.09%~24.20% the decreasing of maximum water holding capacity and capillary volume were most serious in soils of 0~30 cm depth. Our study revealed the impacts of draining on structure of terraces and soil property in Hani Paddy terraces. The findings could enhance the understanding of the biophysical changes in soil during the marginalization in paddy terraces, which would benefit to the conservation and restoration of paddy terraces.