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研究论文

黄土丘陵沟壑区退耕草地土壤质量演变

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摘要 以黄土丘陵沟壑区土壤的主要功能为依据，选取12个代表性土壤指标，采用因子分析方法析取控制土壤质量的公共因子，分析退耕草地土壤质量的演化机理。结果表明，退耕草地土壤质量的主要影响因子依次为土壤腐殖质因子、水土保持因子和力学因子。永久草地和退耕20a荒坡草地的表层（0～10cm）土壤质量最佳，且均随土层深度的增大而降低。农地40～50cm和0～10cm土层土壤质量最差，但其成因不同，前者主要是腐殖质条件差引起的，而后者主要在于较差的水土保持和力学性能。与农地相比，草地坡面的土壤质量和水土保持性能均显著增强，且荒坡草地的水土保持性能和0～10cm土层土壤质量均随退耕年限的延长而提高。退耕年限（3a）相同的荒坡草地土壤质量显著优于人工草地，但在水土保持性能上前者显著差于后者，这表明人工营造牧草植被不失为控制该区水土流失的一种有效途径。

关键词 土壤质量；水土保持；退耕草地；因子分析；黄土丘陵沟壑区

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Soil quality evolvement of farming-withdrawn grassland in hilly and gully loess regions

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Abstract It is one of the most important roles of soil in hilly and gully loess regions to reduce or control soil and water loss. The soil samples were taken from 0～50 cm soil at an interval of 10 cm in permanent grassland, 20-year, 8-year and 3-year farming-withdrawn grasslands, 3-year artificial grassland and farmland (Control). Twelve representative soil parameters were chosen to screen the main factors affecting soil quality by factor analysis, and therewith analyze the soil quality evolvement of grassland. The results showed that, soil quality mainly depended on the factors concerned with soil humus, water and soil conservation and soil mechanics. Permanent grassland showed the best humus conditions in 0～10 cm soil and its soil upper layers were better than its lower layers in humus conditions. Compared with farmland, farming-withdrawn grasslands presented greatly increased soil humus, especially in 0～10 cm soil. 3-year farming-withdrawn grassland had better humus conditions in the soil layer spanning from 20 to 50 cm than the other farming-withdrawn grasslands. Grasslands clearly got their soil- and water- conserving capability improved, and the improvement in their water- and soil-conserving capability become weak with increased soil depth. The longer the grasslands were withdrawn from farming, the better they conserved soil and water. Farmland showed the poorest mechanical soil properties in 0～10cm soil and this was mainly because soil tillage damaged soil cohesion. Because of its loose soil conditions, permanent grassland presented poorer mechanical properties than farming-withdrawn grasslands did. Permanent and 20-year farming-withdrawn grassland showed the ablest soil quality in 0～10 cm soil among the various lands, and their soil quality declined with soil depth. Farmland showed the poorest soil quality in the soil layer spanning from 40 to 50 cm and 0 to 10 cm, but the reasons for the poorest soil quality differed between them, the former poor quality resulting from poor humus condition

s and the latter being caused by poor soil and water conservation and poor soil mechanical properties. 3-year farming-withdrawn land presented slightly different qualities among different soil layer. Both farming-withdrawn and artificial grasslands got notably improved in soil quality, especially in 0～20 cm soil. Soil quality of farming-withdrawn grasslands got improved in 0～10 cm soil layer as the farming-withdrawing period continued. Under the same farming-withdrawing period (3 years), farming-withdrawn grasslands presented better soil quality than artificial grassland, but the latter capability of soil and water conservation was notably superior to the former's. This suggested that it should be an effective approach of controlling water and soil losses in the regions to construct artificial grasslands.

Key words soil quality；soil and water conservation；farming-withdrawn grassland；factor analysis；hilly and gully loess region

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