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Aggravated water deficit in the Loess Plateau of China as indicated by the soil available water content

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The soil available water content (AWC) has a strong ability to indicate the soil water conditions under different land cover types. Although the AWC has long been calculated, soil water characteristic curve estimation models and the distribution of AWC, as well as the impact factors, have rarely been evaluated in the Loess Plateau of China. In this study, four typical land cover types were selected: introduced shrubland, introduced grassland, natural restored shrubland and natural restored grassland. Four widely used models were compared with the van Genuchten (VG) model, including the Arya and Paris (AP) model, Mohammadi and Vanclouster (MV) model, Tyler and Wheatcraft (TW) model, and linear fitting (LF) model to estimate the wilting point. The distribution of AWC and the relationships with environmental factors were measured and analyzed. The results showed the following: (1) the MV model was the most suitable model to estimate the soil water characteristic curve in the Loess Plateau; (2) the factors impacting the AWC varied under different precipitation gradients, and the area with a mean annual precipitation of 440-510 mm was the most sensitive zone to environmental and vegetation factors; and (3) the soil water deficit was more severe when considering AWC than when considering soil water content (SWC), and the water deficits were different under introduced grassland and introduced shrubland. Consequently, the construction of vegetation restoration should be more cautious and consider the trade-off between soil conservation and water conservation. During restoration, policy makers should focus on the AWC in addition to the SWC to better assess the soil moisture status.