

Root system significantly affects soil water movement in banana plantation

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Xishuangbanna is one of the most suitable areas for banana cultivation in China. Heavy application of chemical fertilizers, pesticides, and irrigation in banana plantations has disturbed the soil environment.

However, the basic characteristics of soil properties and water transport in banana plantations are unknown yet, which hinders the understanding of the soil hydrological process and restricts the analysis of soil and water loss.

In a study published in *Land Degradation & Development*, using the high-resolution dyeing technique at the plot scales, researchers from the Xishuangbanna Tropical Botanical Garden (XTBG) of the Chinese Academy of Sciences have quantified soil water flow behavior in the banana plantation and the effect of soil physical properties on [water transport](#).

The researchers selected two banana plantations with different planting years (one-year and four-year) for soil water movement research. They wanted to investigate soil water movement characteristics at different banana planting ages and reveal how changes in preferential flow were associated with soil properties.

Three-dimensional spatial distributions of the dyeing depth showed uneven water flow pattern with the root zone had deeper water flow, while the non-[root zone](#) had shallower water flow. Preferential flow was the main mechanism of soil water transport in the banana plantation, and was significantly affected by soil bulk density, porosity, and banana root systems.

In the banana plantation, soil physical properties changed significantly with increasing soil depths. Lower bulk density, higher porosity, and field water capacity appeared in the shallow soil layer than deeper soil layers.

The redundancy analysis showed that banana root biomass was the major factor influencing the dyeing area, followed by soil porosity. By comparison, both the soil surface infiltration and the preferential flow of

four-year plantation plot were stronger than that of one-year plantation plot, though the bulk density of four-year plot was higher. The root systems of the four-year plot were more developed than that of one-year plot and a large number of pore channels have formed around the [root systems](#), which promoted the preferential flow.

"The banana root system is the most important factor affecting soil water flow behavior. The soil structure decreases with the increasing planting age. Therefore, it is essential to improve the monoculture planting duration in the [banana plantations](#), so as to avoid soil structure degradation," said Liu Wenjie of XTBG.

More information: Wanjun Zhang et al, Soil water movement differences relating to banana (*Musa nana* Lour.) plantation regime, *Land Degradation & Development* (2022). [DOI: 10.1002/ldr.4264](https://doi.org/10.1002/ldr.4264)

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