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Popular Article

Agroforestry as a Catalyst for Groundwater: A Mutualistic Relationship Explored

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There's no doubt agriculture needs water; in fact, it accounts for around 70 per cent of the world's water use. Agriculture also contributes to water contamination. Growing trees on farms can reduce water consumption, help retain water for crops and provide protection to watersheds. With the global population steadily increasing and food production demands rising, agricultural water use is projected to grow by 19% by 2050. In light of climate change, enhancing water management in agriculture has become more essential than ever.

Agroforestry has the potential to enhance local water cycles and improve farmers' access to and control over freshwater resources. Trees play a vital role in both local and global water systems. Integrating trees into agricultural landscapes can strengthen food production while meeting water demands without negatively impacting nearby or downstream users. This summary highlights how trees contribute to greater water security on smallholder agroforestry farms in tropical regions and explores the potential of agroforestry as a tool for restoring degraded lands, increasing their resilience to climate change, and lowering greenhouse gas emissions.

Agroforestry practices, such as homegardens, improved fallows, sil-vipastoral systems, and alley cropping have been identified as some of the most important in regulating water on farmlands through the buffering of micro-climatic conditions. This buffering reduces evaporation losses, transpiration, and enhances water conservation (Kaushal *et al*., 2021).

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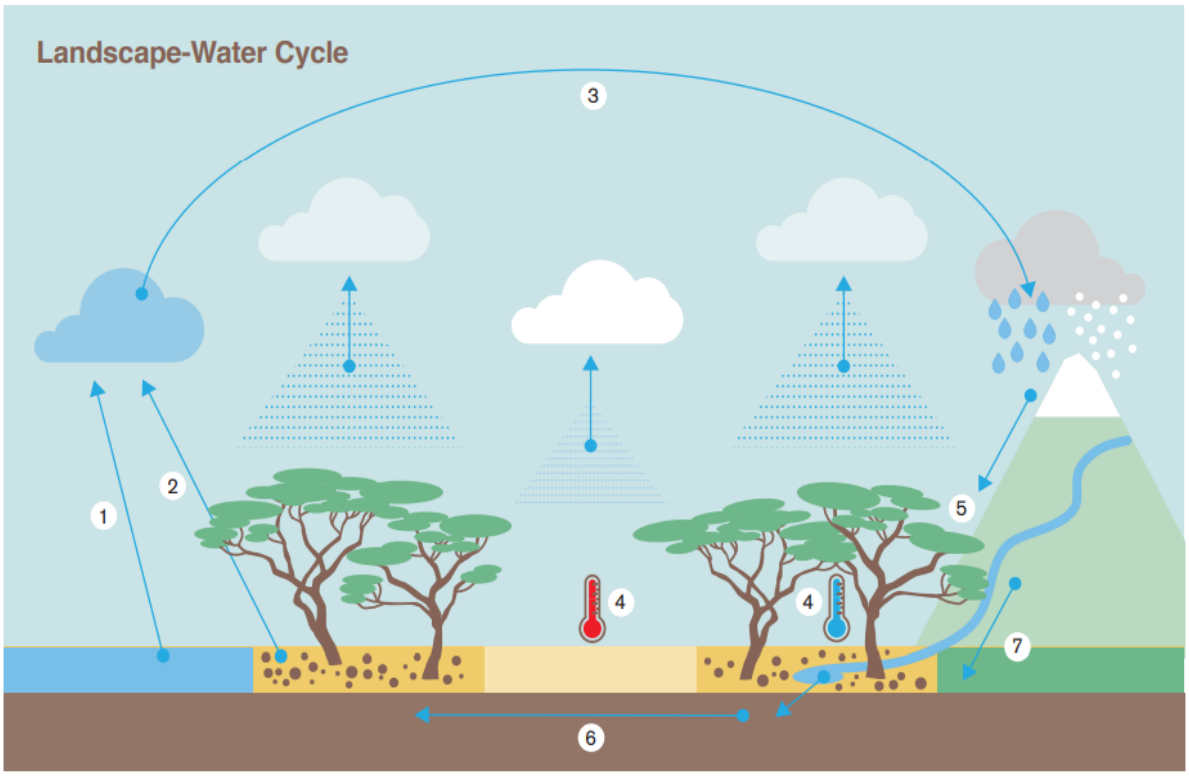
Trees and the Water Cycle

Trees pull water from the ground and release it into the atmosphere as vapor through their leaves in a process called transpiration, which influences local temperatures and rainfall locally and across the globe. Water cycles operate at multiple scales; from global and regional, down to catchments. Trees have a key function in these hydrological cycles. Tree transpiration supports moisture recycling. The hydrological process contributes to local rainfall, atmospheric humidity and cloud cover as well as cross-continental transport of atmospheric moisture that can influence water availability in remote downwind locations



Trees in agroforestry systems offer a range of water-related ecosystem services essential for agriculture (van Noordwijk *et al*., 2019), such as regulating water flow, enhancing soil fertility, and improving water quality, which in turn helps reduce erosion. They also provide valuable shade for crops, animals, and people. By implementing agroforestry—combining trees, crops, and/or livestock on the same land—smallholder farmers can boost water availability both on their farms and in nearby areas, while also minimizing water loss through surface runoff.

Water, though abundant, is becoming an increasingly strained resource under the twin pressures of population growth and climate change. In this context, agroforestry offers more than just an agricultural technique it presents a shift in how we manage and value our natural resources. Rather

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than relying solely on conventional water-intensive farming, integrating trees within farms creates multifunctional landscapes that work with nature rather than against it. The role of trees in influencing rainfall patterns, reducing runoff, and stabilizing local water cycles is not just scientifically evident but practically transformative for smallholder farmers. As we look to secure future food and water supplies, agroforestry stands out not only for its environmental benefits but also for its promise in building climate-resilient and self-sustaining rural communities. It is not just a solution for today, but an investment in tomorrow's ecological balance and human well-being.

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