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Soil potassium forms may help to sustain crops and reduce the need for fertilizer

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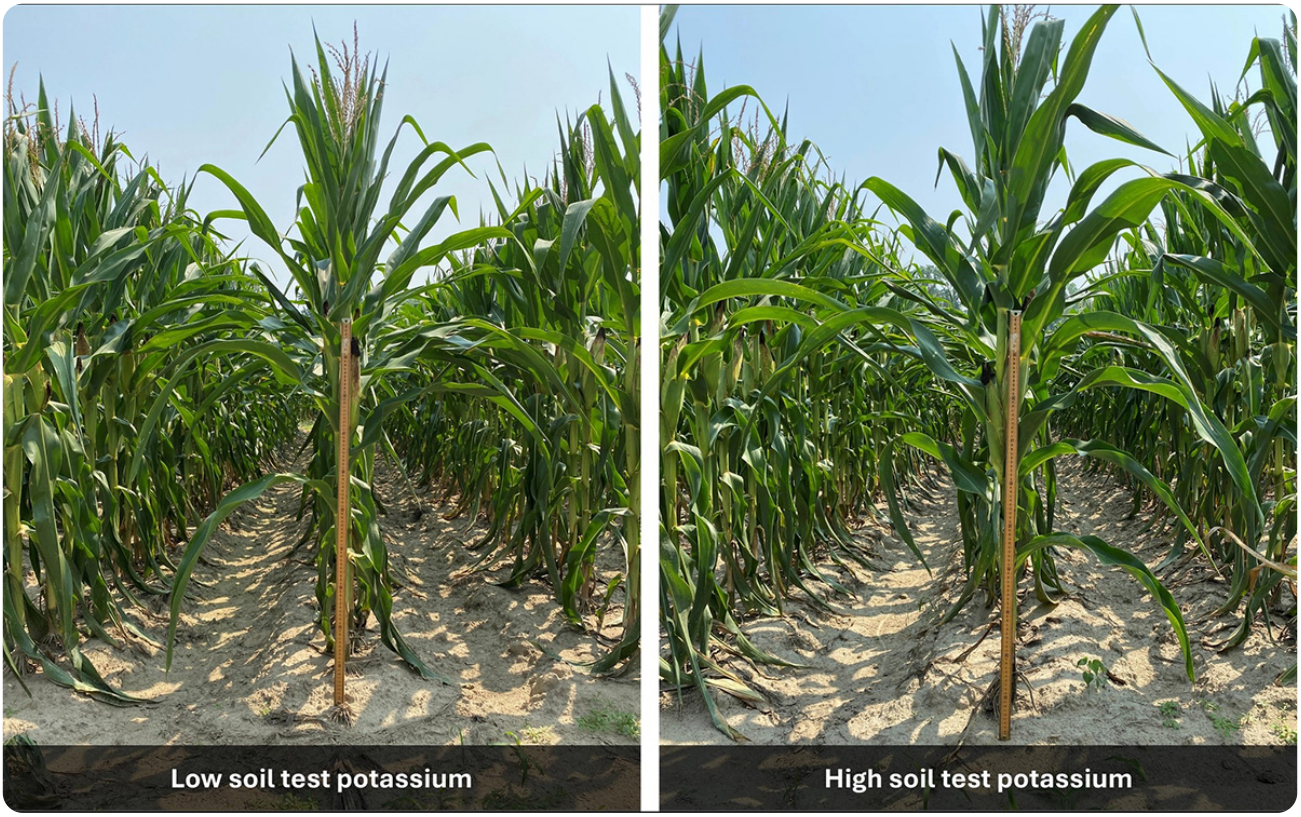

Representative corn plants grown under low (left) and high (right) soil-test potassium (K) conditions in a 41-year field trial on a Coastal Plain sandy loam soil in North Carolina. Despite contrasting long-term soil K management, plants exhibited similar overall growth, illustrating the limited visual response observed under conditions where K-bearing minerals continued to supply K. Photo courtesy of Dionata (John) Filippi, North Carolina State University.

Potassium (K) occurs in various forms in the soil. While crops use readily available K from the topsoil, subsurface layers and less readily available forms of K can also replenish plant-available K over time, potentially reducing the need for fertilizer.

Many weathered soils of the U.S. Atlantic Lower Coastal Plain region contain small amounts of K-bearing minerals, but their contribution to crop nutrition over decades has remained uncertain. Understanding whether K-bearing minerals support plant K uptake is essential for improving fertilizer recommendations.

Researchers evaluated a 41-year potassium fertilization experiment in sandy loam soil in North Carolina, measuring different forms of soil K to a depth of 90 cm. Low fertilizer inputs combined with continuous crop removal gradually depleted K from the topsoil and subsoil. Despite this decline, K released from soil minerals helped sustain crop yields without fertilization. In contrast, fertilizer applications exceeding crop demand increased K accumulation to a depth of 90 cm.

These findings show that subsoil K reserves can play an important role in long-term crop nutrition and should be considered when developing fertilizer recommendations. Accounting for both topsoil and subsoil K can improve fertilizer efficiency while reducing unnecessary applications and the risk of nutrient loss.

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Filippi, D., Gatiboni, L., Lima, A., Hardy, D., Osmond, D., & Tiecher, T. (2026). Soil potassium pools across depths limit crop response in sandy loam soil. *Agronomy*

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