

LEADER (Leaf Element Accumulation from Deep Roots): a Nondestructive Phenotyping Platform to Estimate Rooting Depth in the Field

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TECHNOLOGY READINESS LEVEL

4

Seeking

Licensing | Research

Keywords

- Elemental Leaf Content
- Root Depth
- XRF

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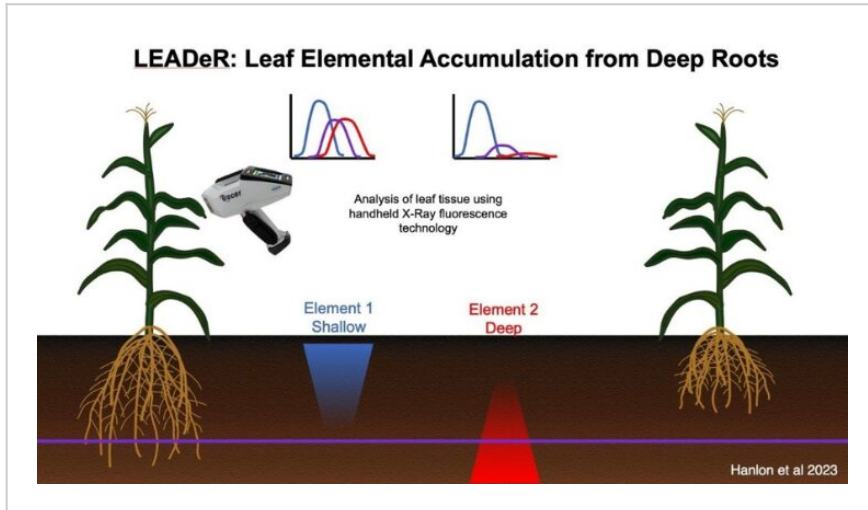
Other Researchers

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Depiction of a handheld LEADER device measuring element content from leaf of a plant

Technology Summary

The inventor's technology, LEADER, is a method to measure root depth. In their studies, they find that maize leaf elemental profiles differ with rooting depth in multiple fields across the country. LEADER relies on the root activity and elemental uptake. The inventors also used Strontium as an elemental tracer in both greenhouse and field studies and found a strong correlation with root growth. Our inventors use XRF to analyze the strontium content and provide measurement over a time period, that is faster and cheaper than ICP-OES and ICP-MS. LEADER doesn't just provide a snapshot of root depth at a specific time, but rather maps it over time.

Application & Market Utility

Rooting depth is important for the crop's ability to pull nutrients and water from the soil, interact with soil biota, crop anchorage, and atmospheric carbon sequestration. Deep rooted crops are an avenue to increase plant water capture, increase nitrogen uptake, and increase long-term soil carbon storage. Currently, measuring root depth is a challenge. Current measurement methods are destructive, laborious, or imprecise. Methods such as direct excavation, soil coring, and minirhizotrons are invasive and aren't very practical. MRI, CT, and PET scans are expensive, and are not yet suited for field work. A feasible alternative that is non-costly, non-invasive, and effective is needed to make accurate measurements of root depth.

Next Steps

LEADER can be used as a tool to develop more drought tolerant, nitrogen efficient, carbon sequestering crop genotypes, and to assess rooting depth for carbon capture in perennial species.