Session 3: *Enhancing resource use through deep rooting – What is the potential for water and nutrient uptake by deep rooted crops?*

Water and nutrient uptake by deep rooted crops: reasons to be hopeful without succumbing to over-optimism

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THE UPLIFT OF SOIL NUTRIENTS BY PLANTS: BIOGEOCHEMICAL CONSEQUENCES ACROSS SCALES

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- Plants take up and cycle heavier elements such as Ca, Mg, K and P that they extract from soil minerals resulting in shallower vertical distributions for strongly cycled elements than for others
- Eucalypts were found to reduce Mn pools by half at medium soil depths and increase Mn concentrations by an order of magnitude at the soil surface, within 50 years
- K pool in the top 20 cm of soils would be 30 to 50% smaller than its current size without plant uplift

Climate and soil-age constraints on nutrient uplift and retention by plants

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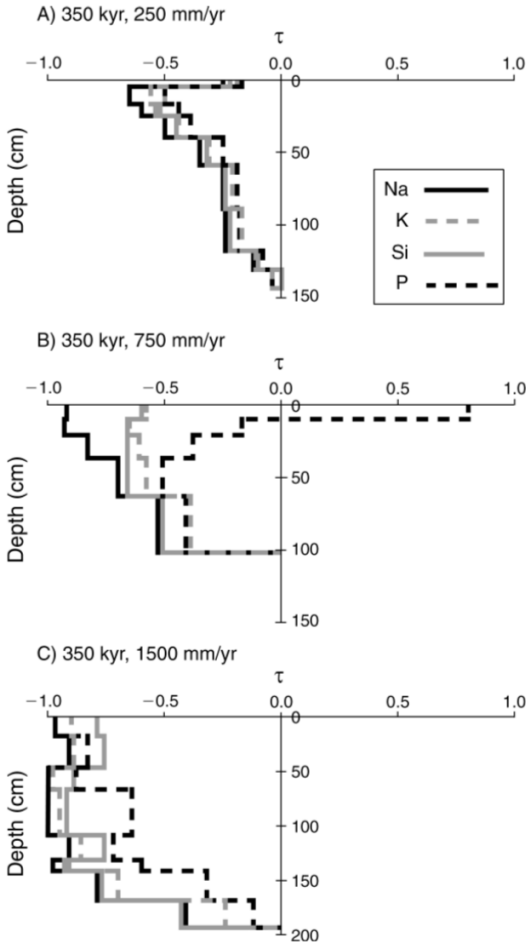
- The effects of soil aging on plant uplift and retention of nutrients differ markedly with precipitations, with substantial enrichments in both nutrient cations and P relative to Na in the surface horizons at intermediate rainfall (750-1,400 mm/yr)



Ecology, 90(3), 2009, pp. 623–636

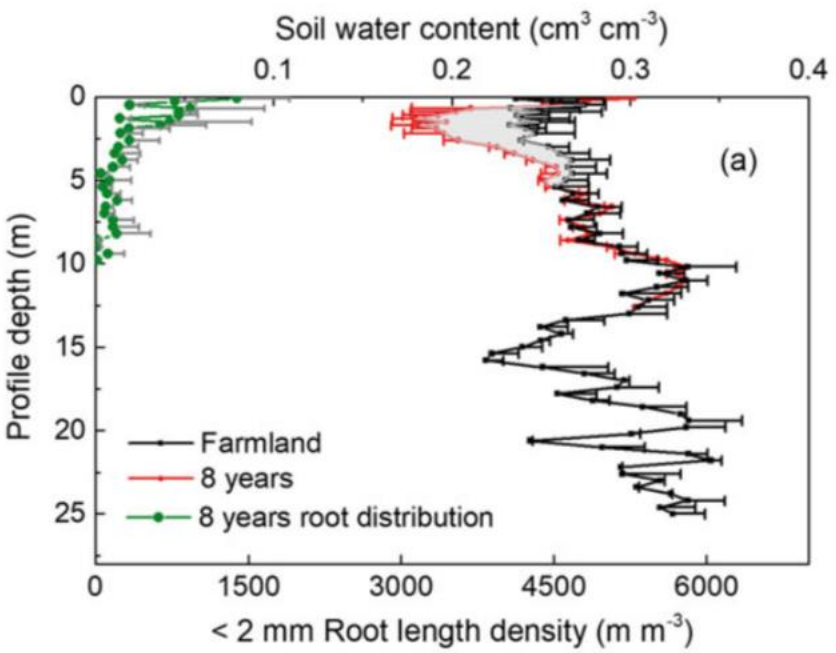
DOI: 10.1002/hyp.13346

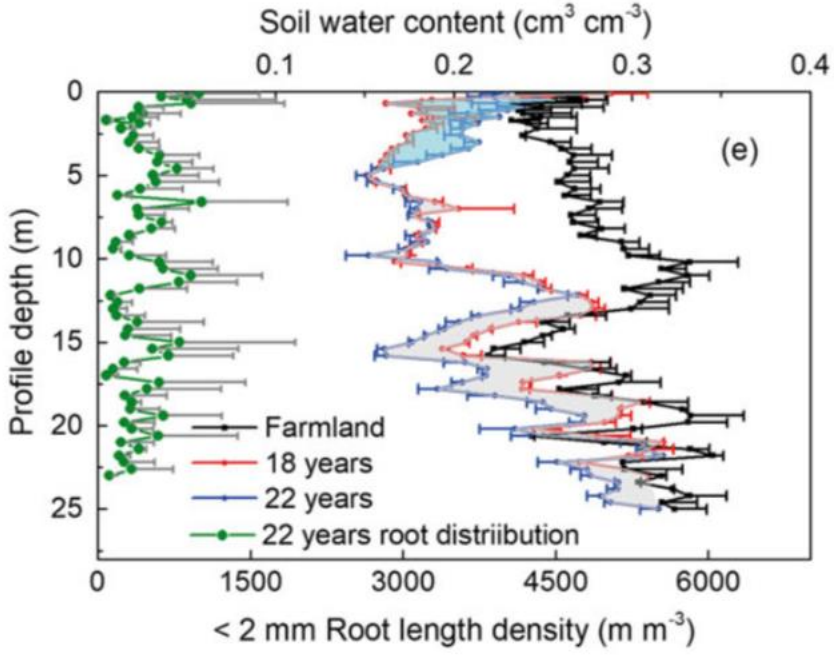
SCIENTIFIC BRIEFING

WILEY HP TODAY

Water mining from the deep critical zone by apple trees growing on loess

Huijie Li[1] | Bingcheng Si[1,2] | Pute Wu[1] | Jeffrey J. McDonnell[3,4]





Soil water deficit in deep soil increased with tree age and was 1,530 ± 43 mm for a stand age of 22 years

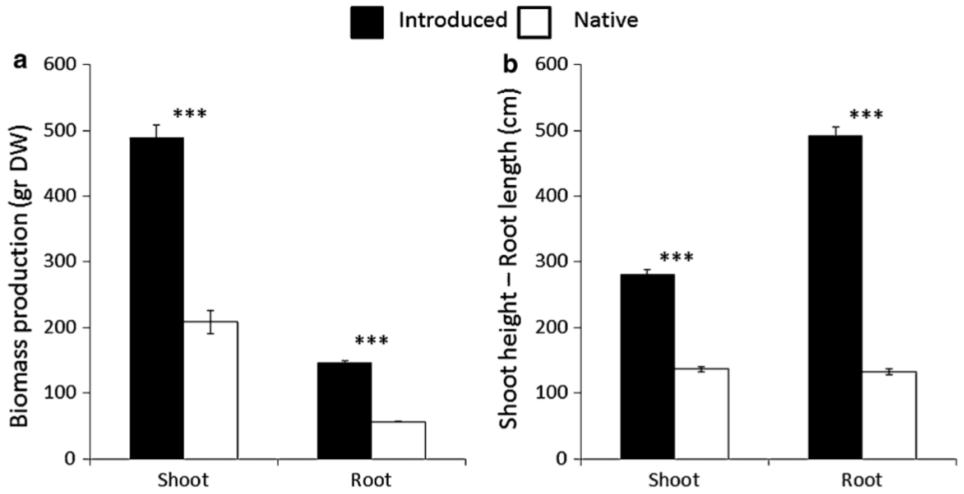
Hydrological Processes. 2019;33:320–327

Plant Ecol (2016) 217:1307–1314
DOI 10.1007/s11258-016-0656-z

CrossMark

From America to the Holy Land: disentangling plant traits of the invasive Heterotheca subaxillaris (Lam.) Britton & Rusby

Marcelo Sternberg



In a few decades only, the length of the roots of this American-native annual increased from a maximum of 1.5 to > 5 m and it became a perennial that survives the dry summer period

What is the potential for water and nutrient uptake by deep rooted crops?

1. Deep nutrient / water mining and uplift by plants are documented processes (although essentially in trees for nutrient mining / uplift)

2. Interactions with abiotic factors might affect/complicate such processes

3. Root plasticity is such that it might allow harnessing such process through the selection of phenes/ideotypes for deep resource use by crops in an hopefully near future