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I am research fellow at the University of Manchester, UK. My research interests are focused on the effects of land use and climate change on soil biodiversity, and subsequently on the effects of changes in soil biodiversity on ecosystem processes. I am particularly interested in how plants and soil organisms interact under these changing circumstances, and how this influences ecosystem processes like nutrient and carbon cycling.

Within the EcoFINDERS project, I am leading the mesocosm experiment (Task 1.4) in WP 1. In this field-based mesocosm experiment, we will assess how plant communities that differ in root traits that are associated with belowground C inputs will affect the resistance and resilience of belowground communities to drought. Extreme weather events, like prolonged periods of drought followed by heavy rainfall, are predicted to increase with climate change. These events greatly impact on soil: they can kill plants, soil fauna and soil microbes, and disrupt soil structure, resulting in a pulse of C and N mineralization and thus increased loss of C and N from soil. In addition to these immediate effects, drought can have long lasting legacy effects on the composition of plant communities and soil food webs (Liiri et al. 2002; Lindberg & Bengtsson 2006; De Vries et al. 2012a). Different soil food webs differ in their response to drought; recent evidence shows that fungal based soil food webs, which are associated with more extensively managed systems, but also with plant communities that consist of relatively slow-growing, N-conservative plants (Orwin et al. 2010; De Vries et al. 2012c), are more resistant to drought, and retain their C and N better, than bacterial based soil food webs of more intensively managed systems with fast-growing, N exploitative plants (De Vries et al. 2012a). Moreover, plants have been shown to play a role in the recovery of the soil food web after drought; increased soil C availability through belowground plant inputs increases the resilience of especially the lower trophic levels (fungi and bacteria) (De Vries et al. 2012b). Plant rhizodeposits are strongly correlated to root biomass, and because different plant species differ in their root biomass and rhizodeposits, different plant communities will affect the recovery of the soil food web and processes of C and N cycling after drought differently.

The specific hypotheses we want to test are: (1) Greater root biomass/rhizodeposition leads to greater stability of belowground processes and communities; (2) Wider range of C inputs, in terms of their quality and quantity, leads to greater stability of belowground communities and the processes of C and N cycling that they drive; and (3) There is a positive relationship between aboveground and belowground stability and processes of C and N cycling.

To test these hypotheses, I have set up a field-based mesocosm experiment with plant communities consisting of four species: Anthoxanthum odoratum, Dactylis glomerata, Leontodon hispidus, and Rumex acetosa. I selected these species from a pool of 24 grassland species of which I measured root traits; the four selected species differed widely in their root systems. All four species are present in each mesocosm (containing 36 individuals), but in varying abundance to create plant communities that differ in their aggregate root traits. These plant communitiies will be subjected to a drought, alongside a control treatment. After ending the drought, vegetation will be pulse-labelled with 13C to allow tracing of plant-derived C into the soil and different soil biota. In addition, the composition of the soil food web and microbial community will be measured, alongside C and N fluxes.

This experimental set up will allow us to quantify the role of plant-derived C in the recovery of the soil food web after drought, and it will inform on how root traits are linked to resistance and resilience of plant communities to drought. In addition, we will be able to elucidate how different root systems select for different soil food webs and their functions.

De Vries et al. (2012a) Nat. Clim. Change, 2, 276-280; De Vries et al. (2012b) Oecologia, in press; De Vries et al. (2012c) Ecol Lett, in press; Liiri et al. (2002) Oikos, 96, 137-149; Lindberg & Bengtsson (2006) Oikos, 114, 494-506; Orwin et al. (2010) J. Ecol., 98, 1074-1083.