Restoration of novel native ecosystems within an intensive agricultural landscape

Rebecca Dollery[1], Prof. Nicholas, M Dickinson[1], Mike Bowie[1]
[1]*Lincoln University*

Some 50% of New Zealand's land area supports an agricultural matrix with depauperate native vegetation. This paper aims to demonstrate that we have the capability to effectively re-create native and more natural ecosystems within this landscape and on a soil template that has been profoundly modified from its natural condition. Equally important, a successful ecological restoration might also mediate the environmental footprint of agriculture. A large-scale case study is described involving conversion of lowland plantation forest to intensively precision-irrigated dairy farming, with protection of natural dryland remnants and restoration of significant natural but novel biotic assemblages. We describe how the physico-chemistry of soils has been modified, linking this with the challenges for conservation and the restoration trajectory. Experimental results show a significant interplay between native vascular and non-vascular plants and rhizospheres that both significantly modify and are influenced by soil hydrology, pH, and soil biogeochemistry. Beneficial ecosystem services are demonstrated through restoration plots on set-aside and marginal land. Our findings shows that selection of plant traits from New Zealand's unique biodiversity palette provide an opportunity to resolve some of the environmental constraints currently impacting agriculture, thereby future-proofing and adding value to agricultural production systems. This is introducing a new paradigm of incorporation of nature conservation into mainstream farm planning, in a country where more than 80% of the native flora and fauna is endemic and found nowhere else. Restoration of biodiversity into intensive agricultural systems in New Zealand may contribute advantageously to a primary industry with a branding based on its clean and green credentials, whilst also playing an important role in environmental protection and conservation of biodiversity. Understanding the linkage of soil physico-chemistry with above- and below-ground biodiversity in the context of restoration trajectories is vital.