GRASS SPECIES EFFECTS ON SOME SOIL PROPERTIES NOW AND IN THE FUTURE

Saman Bowatte[1], Xiaoli Cheng[2], Shona Brock[1], Phil Theobald[1], Dongwen Luo[1] and Paul C.D. Newton[1]

[1]*AgResearch (Grasslands), Tennent Drive, Private Bag 11008, Palmerston North 4442*
[2]*Wuhan Botanical Garden, CAS, Wuhan 430074, PR China*
Saman.Bowatte@agresearch.co.nz

Introduction

New Zealand pastures contain a range of C3 grass species that fill different ecological niches. A frequent case is the presence of species that are found in low and high fertility situations. Examples of these are the low fertility species *Agrostis capillaris* (browntop) and the high fertility species *Lolium perenne* (ryegrass). We expect the different traits expressed by these species to result in different soil properties. Consequently, it is of interest to know how these species will respond to a future climate as there are potential consequences for ecosystem functions such as C and N cycling.

Materials and methods

We measured soil carbon (C), nitrogen (N) and microbiological properties in rhizosphere soil taken from browntop and ryegrass under ambient and elevated CO_2 from the New Zealand Free Air Carbon Dioxide Enrichment (FACE) experiment at Flock house, Bulls (40°14' S, 175°16' E) where pastures had been exposed to elevated atmospheric CO_2 from 1997 (Newton et al. 2010).

Results and Discussion

The total C, total N, soil pH, net nitrogen mineralisation and nitrification potential of two rhizosphere soils were significantly different. The effects of grass species on dissolved organic C, dissolved organic N, microbial biomass C, microbial biomass N and total number and diversity of ammonia oxidising bacteria were significantly interacted by the level of atmospheric CO_2 (see figures 1 to 4).

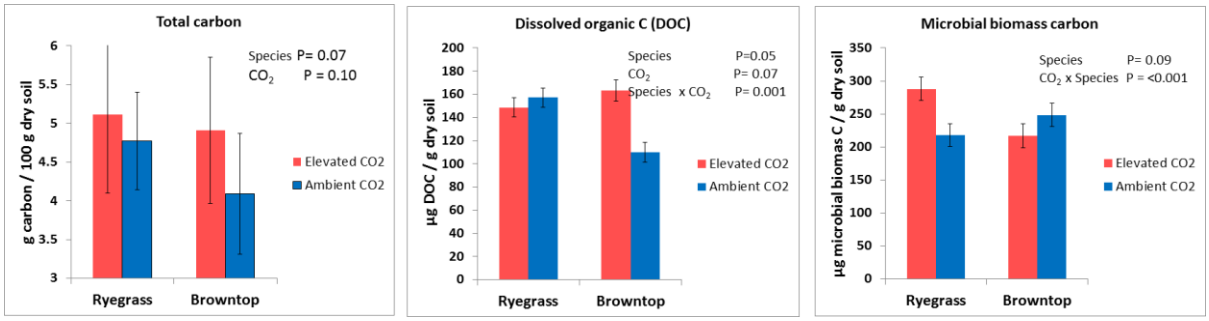

Figure 1: Effect of grass species and elevated atmospheric carbon dioxide enrichment on soil carbon properties

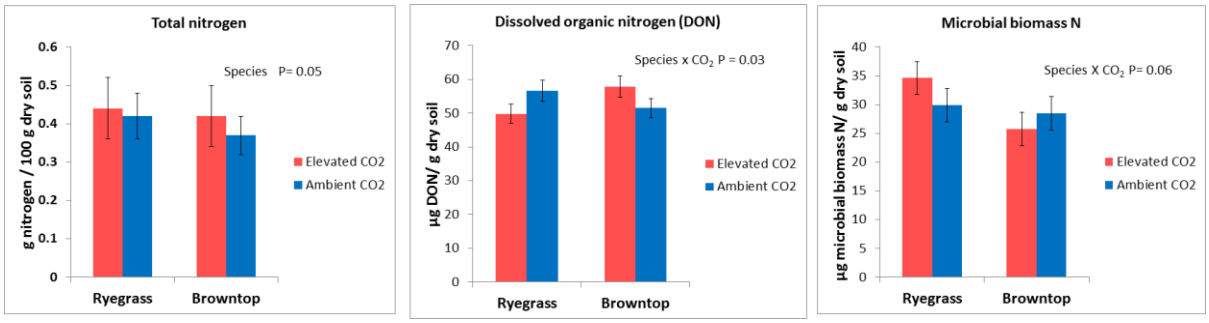

Figure 2: Effect of grass species and elevated atmospheric carbon dioxide enrichment on soil nitrogen properties

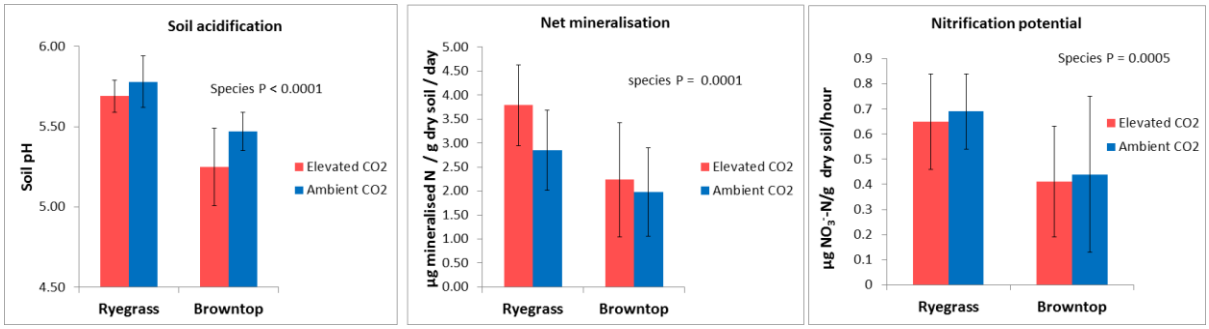

Figure 3: Effect of grass species and elevated atmospheric carbon dioxide enrichment on soil processes.

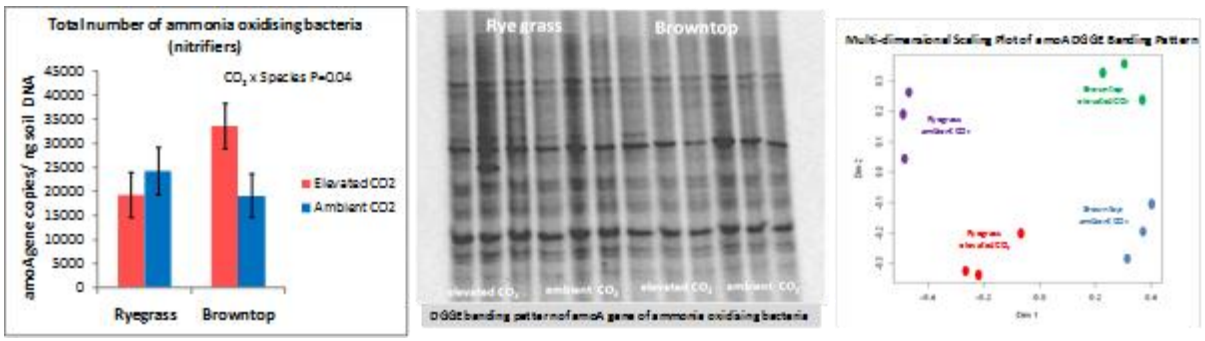

Figure 4: Effect of grass species and elevated atmospheric carbon dioxide enrichment on soil microbiological properties.

Conclusion

Our results indicate that pasture species play key roles in soil C and N cycling and the potential changes in botanical composition under climate change can influence these soil functions.

Reference

Newton PCD, Lieffering M, Bowatte WMSD, Brock SC, Hunt CL, Theobald PW, Ross DJ (2010) The rate of progression and stability of progressive nitrogen limitation at elevated atmospheric CO_2 in a grazed grassland over 11 years of Free Air CO_2 enrichment. Plant and Soil 336, 433-441