Above and below ground responses to the Machair agricultural system

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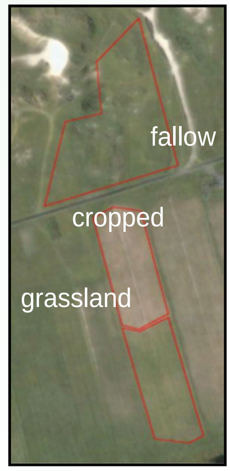
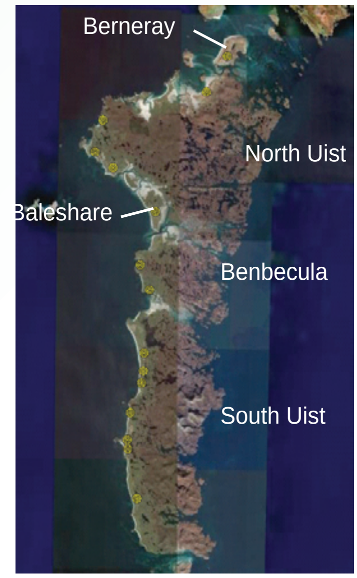
Introduction

Soil maintains an incredibly diverse microbial communities that deliver or are critical for the delivery of a wide range of ecosystem services. Diversity is driven by soil complexity. A healthy resilient soil system is a pre-requisite for ecosystem functioning. Despite this relatively little is known about soil system in general and low input systems in particular. In additioning to providing information relating to the Machair we aim to further gain an understanding into the effects of agronomic practice on soil communities and their function.



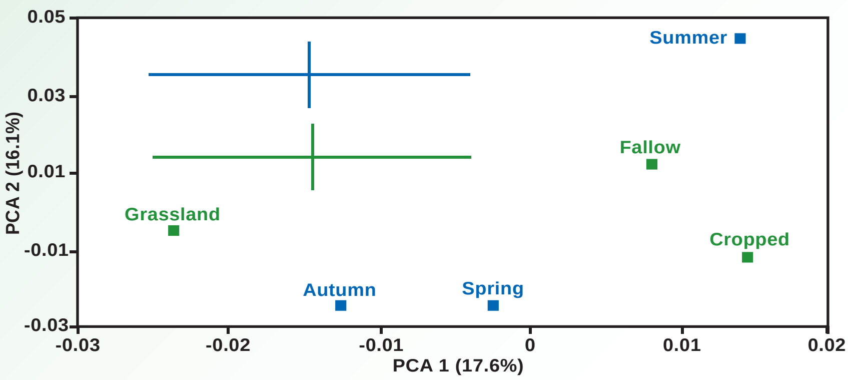


Methodology

Soil core samples were collected from a range of sites across the Uist Island Group (right).

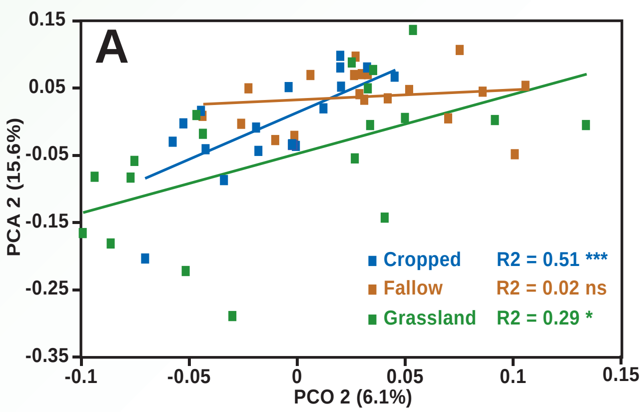
Samples were collected over two years at three seasonal sampling times Cores were taken around three dominat plant species and sub-sampled for bulk soil, rhizosphere and root. DNA extracted and assessed for eubacterial community structure by T-RFLP, preliminary analysis of results shown here.

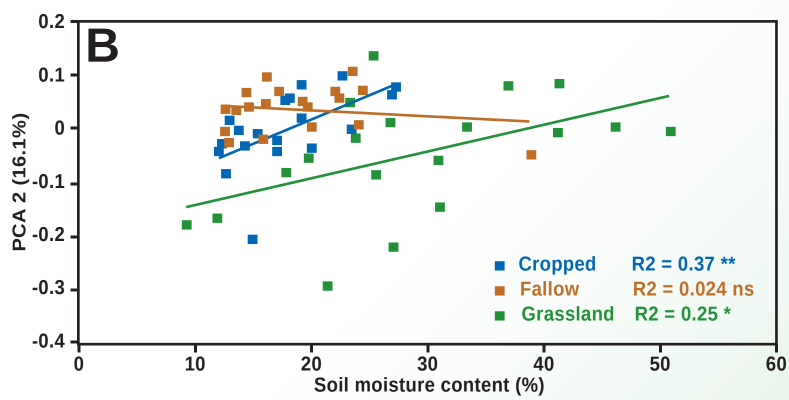
Additionally a plant survey was performed at summer samplings.



Land use and season effects

Principal components analysis indicating a land use and temporal impact on eubacterial community structure at the five “core” locations sampled. ANOVA testing of scores lsd shown (5%) (left)





Relationship between eubacterial community structure and plant community and moisture

Statistically significant relationships exist for bulk soil eubacterial communities from sampled sites during the summer (n = 10) and a) plant species from cropped ($p<0.001$) and grassland ($p<0.05$) habitats and b) soil moisture from cropped ($p<0.01$) and grassland ($p<0.05$). (above)

Factor	All seasons (n = 344)		Summer only (n = 222)	
	p	PC axes	p	PC axes
Location	***	1,2,3	***	1,2,3
Season (S)	***	2	N/A	N/A
Land use (L)	***	1	***	1,3
Plant species (P)	n.s.		n.s.	
Soil compartment (C) (nested in P)	***	2	***	1
Significant interactions				
S x C	***	1,3	N/A	N/A
S x P	*	2	N/A	N/A
C x L	n.s.		**	3
C x S x L	**	2	N/A	N/A

ANOVA significance table

Location, soil compartment (rhizosphere and/or bulk soil), temporal and land management effects strongly influence ($p<0.001$) eubacterial community structure in the Machair. However, those plant species sampled had no effect. A number of interactions were also noted. (left)

Future research

Analyses will be extended to incorporate data for mycorrhizal fungi and nematodes. Two glasshouse-based microcosm experiments will be conducted to assess the impact of different plant species and soil moisture levels on below-ground communities in both Machair soil and a contrasting sandy soil from eastern Scotland (Tentsmuir, Fife).

Acknowledgements

SCRI is supported by the Scottish Government Rural Environment Research and Analysis Directorate. S.N. Vink is funded under a SCRI/University PhD scholarship with the University of Aberdeen.