Functional Soil Ecology and Conservation of Machair in relation to Changing Land Management

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Introduction

Machair is a rare coastal habitat on a calcareous sandy soil in North West Scotland

It is characterised and maintained by low-intensity agricultural practices:

- mixed cropping, with alternating cropped and fallow periods
- use of traditional crop varieties with field grown seed
- seaweed fertilisation
- extensive winter grazing by cattle and sheep

This small scale agriculture has led to a diverse and patchy plant community

The belowground component of the Machair is still relatively unknown

The importance of several key functional soil groups will be examined through an ecological survey and greenhouse experiments

South Uist Machair with traditional stooks

Machair Survey

Hypotheses:

Differences in management regimes will be reflected in the Machair soil community
There will be seasonal and physio-chemical differences in Machair soil communities
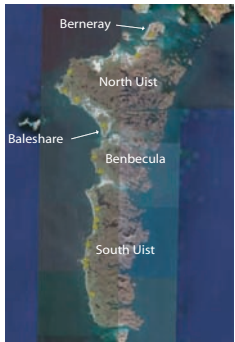
Method:

sampling for:
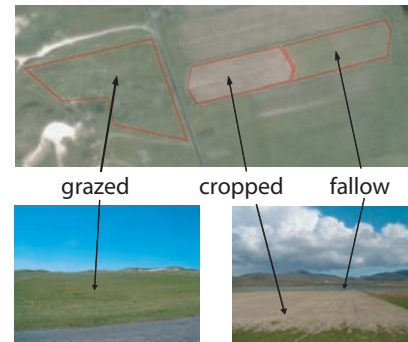nematodes, mycorrhiza and general microbial community

- 3 main land use types
- 15 different locations
- 3 times a year

A vegetation survey was performed in July 2007 at the same sites:

- 9 50x50 cm quadrats per land use type per location
- % cover of vegetation recorded using adapted Domin scale

The 'Uists' showing the 15 sampling locations

grazed   cropped   fallow

The 3 landuse types used in the survey
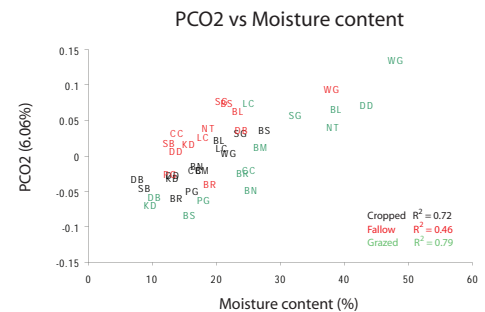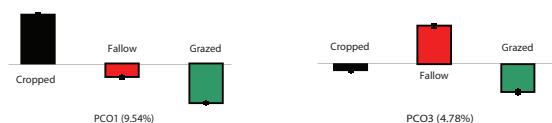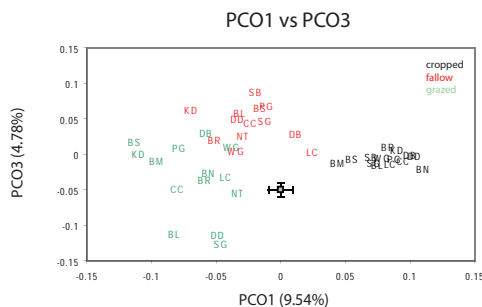
Vegetation Survey

Principal Coordinate (PCO) analysis was performed on the vegetation data in order to get insight into community structure

PCO1 and PCO3 show separation of the different land use types:

Axis 1 separates the cropped areas from grazed and fallow
Axis 3 separates the grazed from fallow areas

The 2nd PCO axis shows a correlation with the moisture content of the soil

PCO1 vs PCO3

PCO2 vs Moisture content

Cropped $R^2 = 0.72$
Fallow $R^2 = 0.46$
Grazed $R^2 = 0.79$

Summary

Land use type and soil moisture content both influence the vegetation composition

Future work will concentrate on:

- further analysis of the vegetation survey data
  - incuding linkage between site, community and abiotic factors
- analysis of below-ground soil communities
  - focussing on nematodes AM fungi and eubacteria
- investigations into links between above- and below-ground community composition