

Balruddery Sustainability Research Platform: a long-term facility for research on arable cropping systems

Cathy Hawes, David Hopkins Cathy.Hawes@scri.ac.uk, David.Hopkins@scri.ac.uk
SCRI, Invergowrie, Dundee, Scotland DD2 5DA

Background

The long-term viability of farming in Scotland depends on the sustainable management of our agricultural habitats. Over the past half a century, intensification of crop production has led to the systematic erosion of arable biodiversity and the degradation of arable habitats in many parts of the world. This has raised serious concerns about sustainability and long term food security, particularly where intensive management has had negative impacts on the functioning of agricultural systems.

Sustainable management of arable systems for both food security and a healthy environment must achieve a balance between maximising crop production, conserving arable biodiversity and maintaining ecosystem functions.



Balruddery Farm, Dundee: AN SCRI LEAF Innovation Centre. The Sustainability Research Platform is highlighted as fields 1-6



GPS mapping of field margins at the Balruddery Sustainability Research Platform

Research Areas

We are studying the effect of sustainable cropping (relative to conventional management) on system processes including:

Carbon and nutrient dynamics (GHG emissions, nutrient leaching, soil C, N, P)

Soil biophysics (physical and biological resilience to stress, and soil properties including structure, strength and water holding capacity)

Hydrology (leaching, run-off and sediment transfer)

Community dynamics (soil micro-organism, invertebrate and weed diversity in relation to nutrient dynamics, decomposition, predation and pollination)

Pest and pathogen dynamics (monitoring the effects of IPM on soil and plant pathogens, and insect pests)

Crop yield and quality (varietal differences in yield, stress response and nutritional compounds)

Field margins (diversity and margin width in relation to system processes including nutrient retention, pollination and predation)

A New Long-Term Experimental Platform

We are establishing a new experimental research platform at Balruddery Farm near Dundee, for long-term studies on arable sustainability. A contiguous block of six fields, covering 40ha, has been set aside for the experimental platform. Each field will be divided in half to compare the effect of our 'sustainable' cropping system with current commercial practice on long-term trends in yield and system health. The Sustainability Research Platform is the first of its scale in the UK and will provide a test-bed for new sustainable management practices and crop varieties, that will:

- (1) maintain yield quality and yield stability at lower levels of agrochemical inputs,
- (2) reduce GHG emissions and nutrient leaching from the system, and
- (3) enhance soil quality and arable biodiversity

Rotation and Treatments

The rotation will run over six years, and includes potatoes, winter wheat, winter oilseed rape, winter barley, field beans and spring barley. The sustainable treatment will include non-inversion tillage, reduced herbicide and pesticide inputs, and inorganic fertiliser replaced by compost, legumes and green manures.

Both conventional and sustainable treatments will be flexible enough to track changes in commercial practices and developments in sustainable technologies over time.

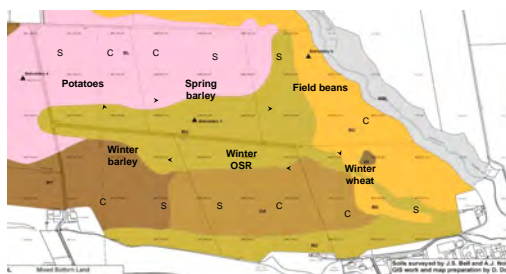
Farming Policy

A major obstacle to change towards more sustainable farming practices is the economic situation of farmers and their appreciation of the importance of the longer-term, wider-scale environmental impacts of arable intensification for maximizing yield. To address this, the Sustainability Research Platform aims to:

-Provide Evidence to demonstrate the longer-term environmental and economic costs and benefits at a scale that is relevant to the commercial farming situation

-Exchange information to raise awareness and ensure that hard evidence is available to farmers, agronomic advisors, agro-chemical companies and policy makers

-Develop policy. Methods to improve sustainability need to be translated into government policy and farming practice. This will require a longer-term view of the impacts of crop production than is currently normal, and may require incentives to encourage farmers to risk potential short-term loss for long-term environmental and economic gain.



Map of the Sustainability Platform showing field allocations and soil series: Balrownie (pink), Buchanyhill (orange), Ruthven (green), Mountboy (brown), Garvock (light brown); C = conventional, S = sustainable management