Centre for Sustainable Cropping: Balruddery platform

A whole-systems approach for optimising crop production and environmental health for long term food security.

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Aims

1. Maintain yield with lower inputs of non-renewable resources through:
   - alternative nutrient supplies and increased resource use efficiency
   - improved soil structure and health
   - reducing losses to the environment

2. Enhance biodiversity for ecosystem services:
   - Pollination
   - Natural enemy control of crop pests
   - Nutrient retention and cycling
   - Carbon turnover and litter decomposition

3. Provide a field-scale test bed for new management interventions and crop varieties in the context of two contrasting long-term cropping systems, supporting a wide range of research projects and funding sources

Field Design:

- Each half field assigned to either Conventional (C) or Sustainable (S) cropping system.
- Within each half, two varieties sown in a block and an 18m strip available for plot-scale experiments.

Crops:

Potato; varieties for 2017 TBC
Winter wheat; consort, viscount, leeds
Winter barley; retriever, infinity, bazooka
Winter oilseed rape; harnass, cracker, anastasia
Beans; varieties TBC, could move to peas
Spring barley; varieties TBC
1. Soil: aim to improve soil structure through increasing carbon content and reducing tillage

Management
- Non-inversion tillage moving to direct drilling
- Straw chopped rather than baled
- Green waste compost added pre-sowing @10 t ha⁻¹

Indicators monitored
- Soil physical structure
- Least limiting water
- Carbon content
- Organic matter content

Trends to date
- Increase in soil carbon
- Decrease in soil strength

2. Plant nutrients: aim to reduce losses, replace mineral fertiliser with renewable sources, increase nutrient use efficiency

Management
- Cover crops over winter before spring sowings
- Intercropping legumes and cereals
- Undersowing clover
- Reduced mineral N inputs
- Renewable sources of nutrient to be included, e.g. food waste, digestates

Indicators monitored
- Biological N fixation
- Plant N concentration
- Crop development, yield and quality
- Soil nutrient levels
- GHG emissions
- Nutrient leaching

Trends to date
- Reduced N and yield in winter sown crops; nutrient supply to spring crops maintained

3. Biodiversity: aim to enhance weed, soil and invertebrate diversity for ecosystem services

Management
- Targeted weed management to allow an understorey of beneficial weed species
- IPM options for pest and disease control
- Reduced reliance on crop protection chemicals

Indicators monitored
- Seedbank diversity
- Emerged weed abundance, cover and biomass
- Earthworm density
- Natural enemies
- Pollinators

Trends to date
- Higher rates of litter decomposition and earthworm numbers
- Higher numbers of emerged weeds
- No consistent effect on seedbank
- Variable effect on invertebrate foodwebs

4. Crop productivity and financial margins: aim to maintain yield and finances at conventional levels

Management
- Compensate reductions in agrochemical inputs with alternative approaches listed

Indicators monitored
- Yield and yield quality
- Input costs
- Fuel use
- Tractor time

Trends to date
- Spring sown crops and winter oilseed rape show no significant reduction in yield
- Winter cereal yields down by 1-2 t ha⁻¹
- Savings on agrochemical inputs spent on compost