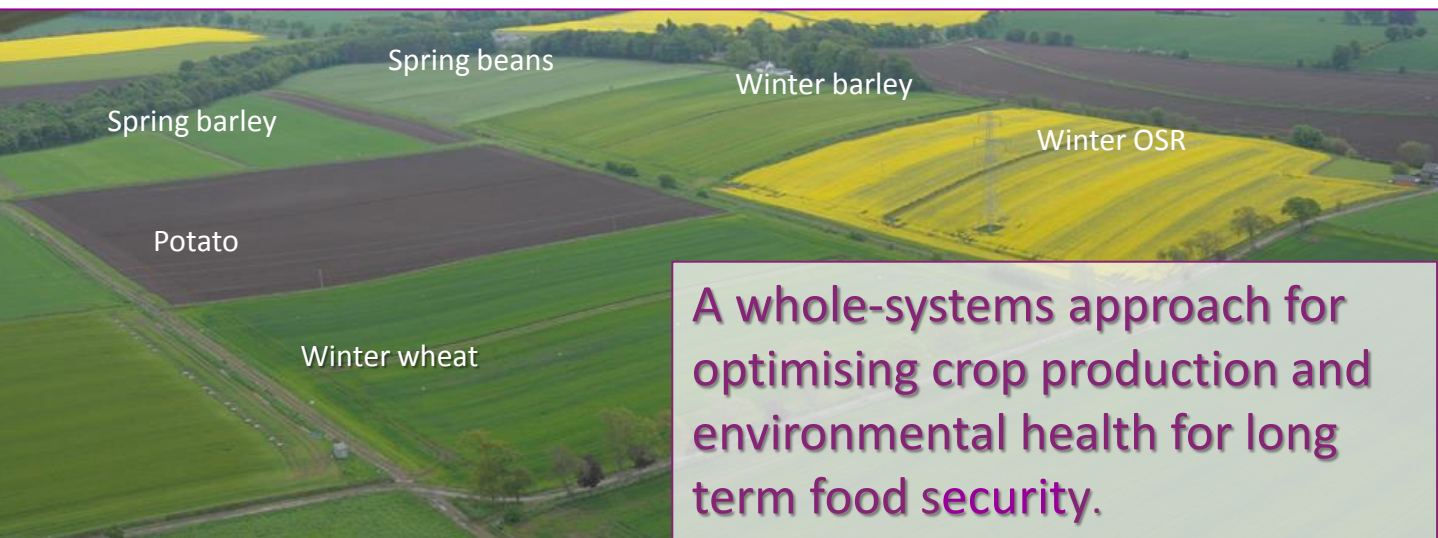


Centre for Sustainable Cropping: Balruddery platform



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

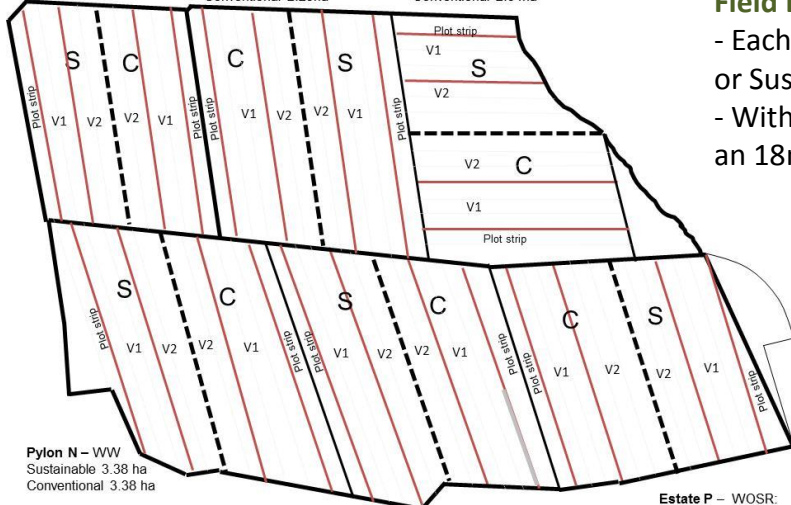
3. Provide a field-scale test bed for new management interventions and crop varieties in the context of two contrasting long-term cropping systems, supporting a wide range of research projects and funding sources



Road K - Potato
Sustainable 2.14ha
Conventional 2.13ha

Middle East L- SB
Sustainable 2.25ha
Conventional 2.25ha

Den South M - Beans
Sustainable 2.54ha
Conventional 2.54ha



Pylon N - WW
Sustainable 3.38 ha
Conventional 3.38 ha

Kennels O - WB
Sustainable 3.22 ha
Conventional 3.22 ha

Estate P - WOSR
Sustainable 3.55 ha
Conventional 3.55 ha

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; harness, cracker, anastasia
Beans; varieties TBC, could move to peas
Spring barley; varieties TBC

The cropping system and indicators for impact assessment

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

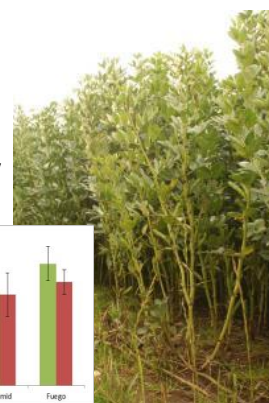
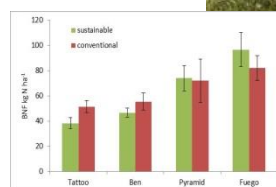
- Cover crops over winter before spring sowings
- Intercropping legumes and cereals
- Undersowing clover
- Reduced mineral N inputs
- Renewable sources of nutrient to be included, e.g. food waste, digestates

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

