Does collaborative farm-scale modelling address current challenges and future opportunities?

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Opportunities for farm-scale models

- Developments in sensors and IT, Internet of Things
  - Enables local parameterisation
- Mitigation of GHG emissions
  - EU effort-sharing decision on non-ETS emission reductions
- Adaptation to climate change
Challenges for farm-scale models

- Scientific
  - How to model new farming technologies (e.g. NH$_3$ stripping)
  - Simulation of effects of weather extremes

- Widen the user base
  - Accessibility
  - Reliability

- Resources for agricultural research
  - Have generally been reducing
  - Increasingly short-term
Widening the user base

- **Usability – user interface**
  - Configuration and input
  - Output and overview of results
  - Help

- **Reliability**
  - Scientific and technical documentation
  - QA/QC – including version control
  - Parameterisation – extent and limits
  - Long-term accessibility – legal constraints
  - Long-term development – scientific, technical
The problem

- Resources required increasing, resources available decreasing

- Single-owner models
  - Model is owned by an individual or single organisation
  - Traditional approach

- Community models
  - Model is owned by a group of individuals or organisations
  - Possible due to increased mobility, collaboration, www
Single-owner models

- Advantages
  - Benefit from earlier investment
  - May have access to cheap labour or a generous benefactor
  - Commercialisation may be an option
  - Streamlined management
  - Low communication overheads

- Disadvantages
  - Vulnerable to fluctuations in funding
  - Vulnerable to staff changes (e.g. retirement)
Community modelling - advantages

- Shared costs
  - Some functions are common for all farm models
  - Technical development
  - Scientific improvements

- Achieve more with less
  - Including access to empirical data for parameterisation & testing

- Intellectual forum, mutual support

- Greater credibility – QA/QC

- Greater resilience to fluctuations in funding, staffing
Community modelling - disadvantages

- Need agreed procedures for
  - Sharing costs
  - Maintaining standards
- Organisational barriers
  - Wish to retain ‘flagship’ models, ‘not invented here’
  - Resistance to sharing costs
- Technical issues
  - e.g. Windows v Linux
  - Migration of existing software modules
- Scientific limitations
  - Some underlying concepts may be inflexible
Who should be talking to whom?

- **Single farm**
  - Management input
  - High detail

- **Many farms**
  - Management simulated
  - Medium detail

- **Arable** → **Pig/poultry** → **Ruminants**
  - Fields
  - Fields
  - Fields
  - Livestock
  - Livestock
  - Manure
  - Manure
  - Grazing
  - Grazing

Optimal for community modelling:
- Similar levels of detail
- Similar time steps
Revolution or evolution?

- Creating a new model system?
  - Compare model simulations using standard scenarios
  - Discuss processes and level of detail
  - Get to know each other
  - Discuss IT, management and cost sharing

- Joining an existing model system?
  - These decisions will have been made

- Competing modelling systems?
  - Probably inevitable (Windows v Linux, programming language)
  - Dialogue between them would be useful
Conclusions

- Resources required increasing, resources available decreasing
  - Farm-scale modellers will need to make strategic decisions
- Single-owner models
  - May continue with additional resources
  - Risk of ‘succession’ problem
- Community modelling is an alternative
  - Need to continue building a community of farm modellers