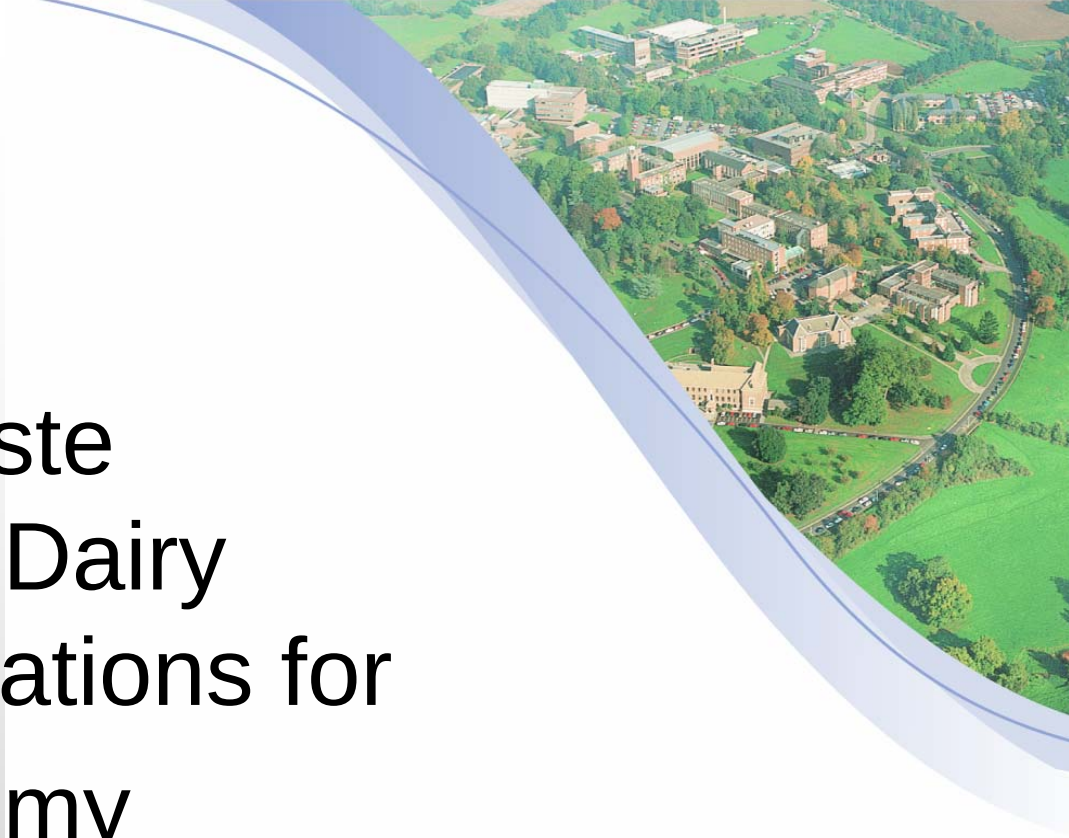


Sustainable Waste Management in Dairy Farming : Implications for the Rural Economy

Michael Winter
Centre for Rural Research

Rural Economies and Land Use (RELU) Programme

Sustainable and holistic food chains for recycling livestock waste to land

Dave Chadwick and Chris Hodgson (IGER)
Louise Heathwaite and David Oliver (Lancaster University)
Michael Winter and Theresa Selfa (University of Exeter)

IGER

UNIVERSITY OF EXETER

LANCASTER UNIVERSITY

Or the title I prefer:

Unruly Pathogens:

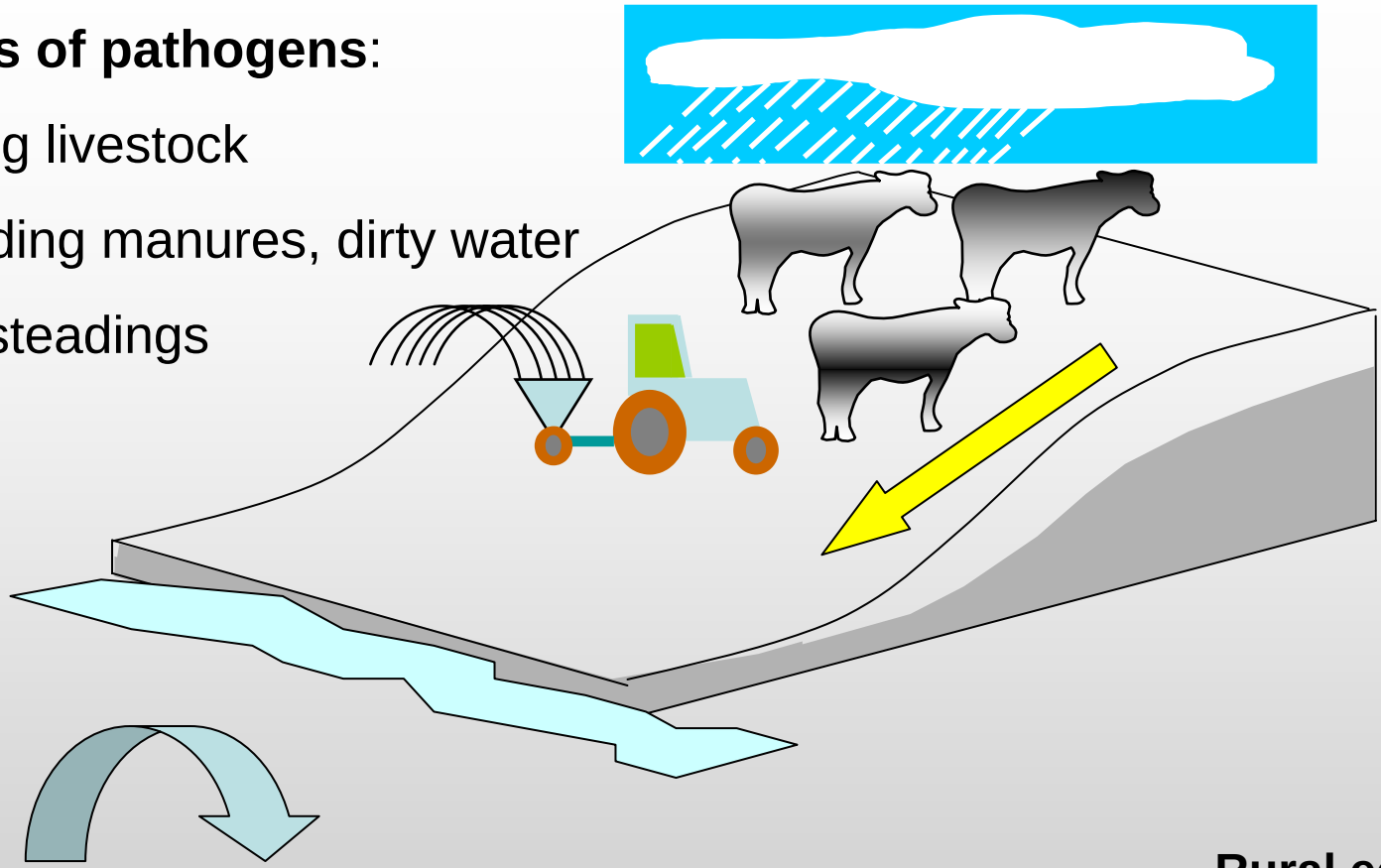
Integrated science to save surfers and shellfish

(UPISSS)

BACKGROUND - pathogen transfers from livestock agriculture

Sources of pathogens:

- Grazing livestock
- Spreading manures, dirty water
- Farm steadings



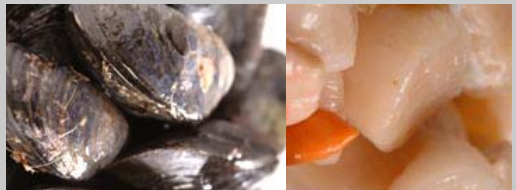
Pathways:

- Drains
- Ditches
- Runoff
- Livestock in streams

Downstream impacts on:

Industries dependant on clean water

Shell fisheries



Tourism

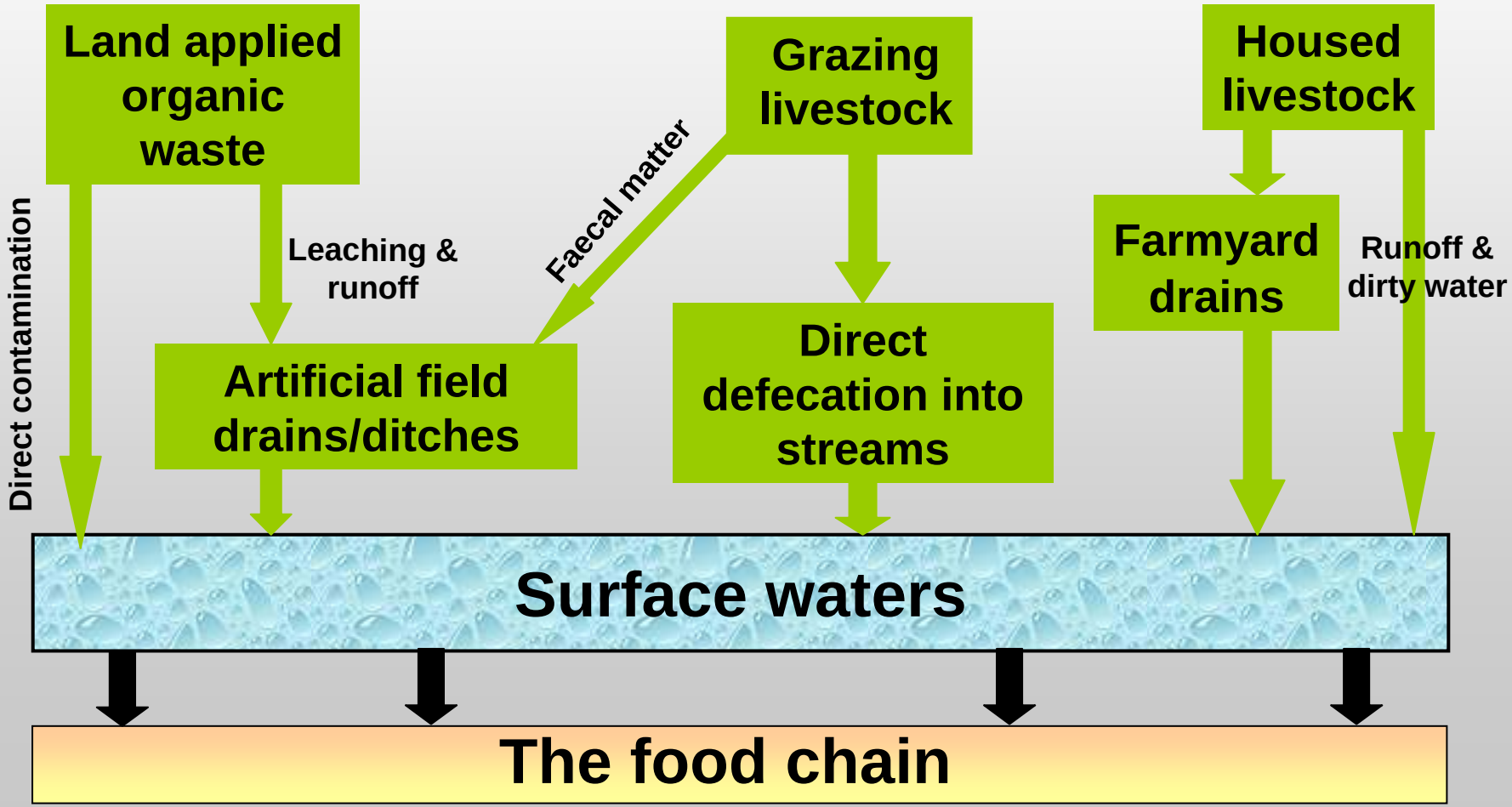
Rural economies

Escherichia coli 0157, *Salmonella* spp, *Campylobacter* spp & *Cryptosporidium parvum*.

- Gastro-intestinal illness estimated to cost the UK economy over £1 billion per annum.
- *Escherichia coli* 0157 alone may cost the UK around £30M annually in healthcare
- Waterborne micro-organisms responsible for c 25% of hospital patients throughout the world.

THE PROBLEM

- ~90 Mt of manure/slurry produced by housed livestock
- ~60 Mt deposited directly onto agricultural land as faeces



- A horror story - dairy farm, river, children.
- Is this waiting to happen?

AIMS

To determine the potential impact of introducing changes in management to control pathogen transfers from:

- grazing livestock
- manures (slurry, dirty water, solid manure)
- other waste streams (e.g. biosolids)

And determine the impact on:

- Farm economics
- Practicalities at the farm level

And ‘knock-on’ effects on:

- local communities
- Industries

Using a multi-scale approach from farm to catchment level

APPROACHES I - Farm and Catchment Scale

• Determine current perceptions of farmers, retailers, consumers & local 'downstream' industries (tourism, shell fisheries)

• Assess impacts of changes in practices at the farm level on costs (farm, other stakeholders, region)

•Undertake risk assessments of pathogen transfers to the food chain from selected farms under current livestock/manure management practices

• Undertake targeted monitoring on farms (up to 10) to establish relationships between livestock/manure management & FIO transfers

• Develop measure to encourage changes in management practices to reduce risk of pathogen transfers & determine impacts on effluent flows & FIO transfers to water

SPECIFIC OBJECTIVES I - Farm and Catchment Scale

- Interview up to 100 farmers (decision making process; waste management practices)

- Establish focus groups (farmers/other stakeholders)

- Develop risk assessment for farms

- Targeted monitoring of FIO transfers (10 farms) + farm activity data

- Change management practices & assess changes in FIO transfer

- Assess costs, practicalities and applicability of pathogen control measures on farms and impacts on **local communities and industries**

APPROACHES II - Farm and Experimental Scale

- Review pathogen controls measures

- Conduct additional experiments to determine:
  - controls on pathogen survival on farmsteads, e.g. manure/dirty water stores/collection yards *(storage time, temperature, ammonia concentration, UV radiation, nutrient availability)*
  - factors controlling pathogen survival in soil following dung deposition/waste applications
  - mechanisms of pathogen transport

Results from these studies will be used for:
- on-farm risk assessments
- measuring the impact, costs and applicability of on-farm management practices

SPECIFIC OBJECTIVES II - Farm and Experimental Scale

- Review pathogen control measures (loads, mobilisation, delivery)

- Assess methods to reduce pathogen transfers to receiving waters from grazing animals & after spreading manure

- Elucidate factors controlling pathogen survival in manure stores and soils

- Investigate mechanisms of transfer from soil

FARM / FIELD

CATCHMENT / REGIONAL

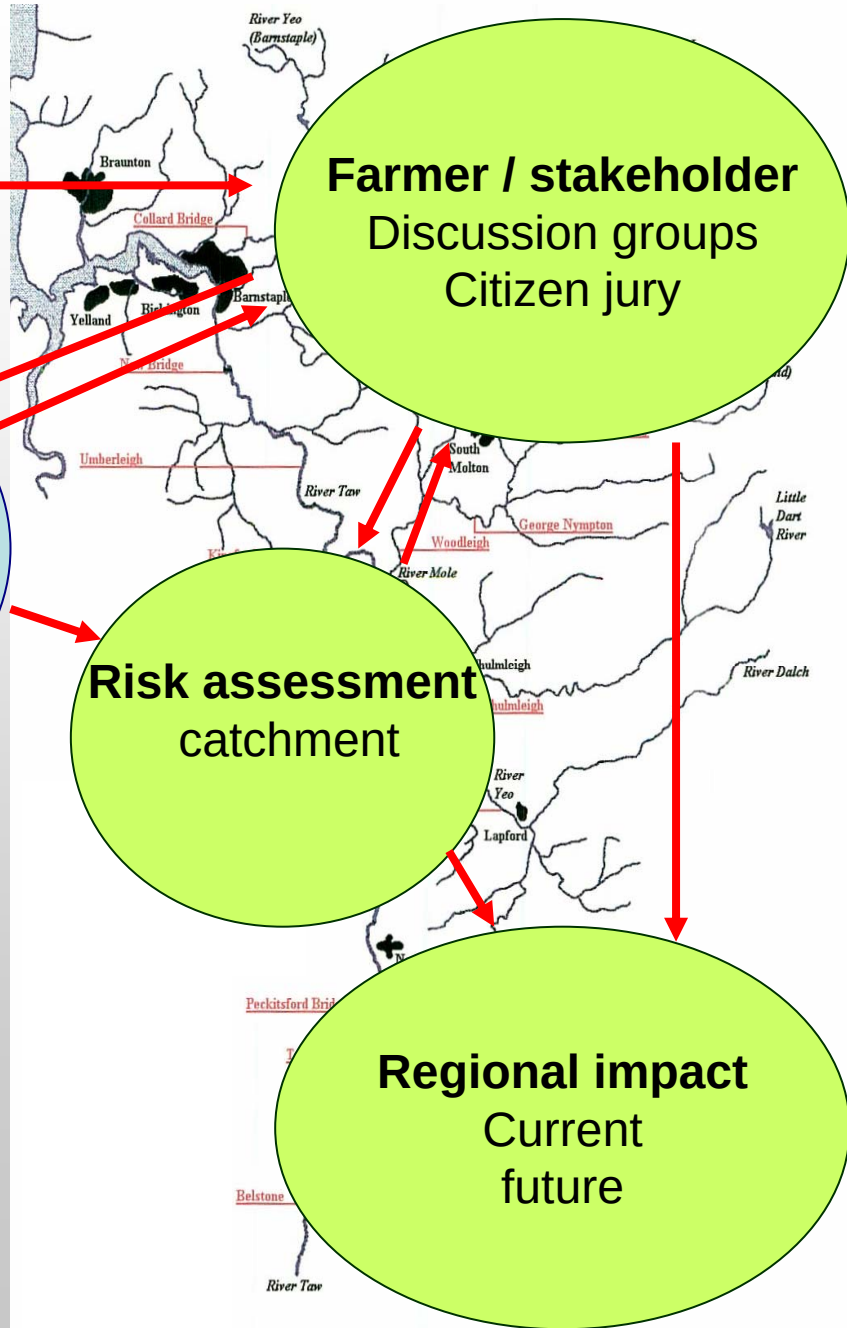
Farmer interviews
Perceptions
Management
Hydrology/typography
Economics

Monitoring
Current
Induce change

Experimental
Controls of survival
Tranport mechanisms

Risk assessment
Field-based tool

Farmer / stakeholder
Discussion groups
Citizen jury



Risk assessment
catchment

Regional impact
Current
future

Potential Rural Economy Impacts

- **Negative** – the **crisis** impact if tourism/recreation is hit (cf. FMD, BSE etc).
- Or if food safety were to be implicated.
- **Negative** – if the measures to be taken by **farmers** are costly and damaging to fragile farm businesses.
- **Positive** – if food/environmental safety can be turned into a positive brand or image by farmers, localities, regions able to demonstrate best practice.