Project:	Sustainable and holistic food chains for recycling livestock waste to land
Project Investigator:	Dave Chadwick
Duration:	2005-08
Impact Summary:	The research developed a simple risk assessment model which will enable environmental managers and advisers to collect data for targeted risk assessment. It also informs farmers about where to take action to reduce risk.

Research Aims

- To investigate the impact of livestock farming on microbial water quality and develop new ways of assessing and managing risks at the farm and field levels

Contribution to knowledge & understanding

- The research established a link between elevated Faecal Indicator Organisms (FIO) concentrations and stock grazing close to unfenced streams and rivers. Monitoring showed seasonal variability in concentrations through spring and summer, coincidental with the grazing season
- The research identified four key issues for developing targeted risk assessment: accumulating microbial burden to land; landscape transfer potential; infrastructural characteristics of the enterprise; and social and economic obstacles to taking action. An approach to assessment showed how these four components interact to influence risk

Implications for policy & practice (e.g. recommendations)

- The risk assessment model developed enabled environmental managers to target data collection and helps inform farmers about where to take action to reduce risk
- Project researcher (Rob Fish) was appointed a social science theme leader for Defra's 'Integrated Water and Agricultural Management initiative' (IWAM), a direct consequence of interacting with scientists at North Wyke Research

Applications of research for public policy/services and business performance

- The research developed a farm-scale costing assessment tool software for reducing the risk of FIO transfers from farms. This tool was designed to allow farmers and advisers to explore the financial burden of employing mitigation measures to reflect the cost and economic decision underlying measures to address microbial transfers to watercourses
- Researcher helped to train CSF Officers (who then advise farmers) about risks of FIO losses from farms to water at a workshop

Stakeholder engagement and contribution

- A project steering group provided context and direction for the research, and feedback and critical comments about the results. This involved stakeholders from the Environment Agency, Defra (water quality), Devon County Council, SWRDA and the NFU
- Key methodological innovations in the development of both field and farm-scale risk assessment tools included the use of expert judgements to establish values for different drivers of FIO risk. The project used a citizens' jury to engage members of the general public and students in policy development. The jury heard evidence from 18 witnesses with expertise in the area of microbial watercourse pollution. This process highlighted emerging public priorities for action and provided an opportunity for stakeholders to discuss policy approaches
- The Citizen's Jury involved representatives from HPA, FSA, Surfers against Sewage, Aquafish Solutions, South West Tourism, Environment Agency, Natural England, South West Water, Defra, Cornwall and IOS Health Protection Unit, Linking Environment and Farming, NFU and members of the public. This was used to elicit public assessments of the social, economic and public health issues surrounding FIO risks and appropriate policy intervention. The participatory nature of the approach enhanced knowledge transfer between the project team and stakeholders and also between different stakeholders

- Over seventy livestock farmers responded to a questionnaire on farm management practices and a further ten participated in a Farmer Discussion Group to consider mitigation (all farmers from monitored farms)
- Early meeting to raise awareness of project with Defra

Stakeholder comments

"During my farming career, the great debate about security of food supply has raged, but since the years of plenty the debate has increasingly turned to food quality, health issues and the environmental impacts of agriculture – and rightly so - as this debate has raised many unanswered questions, not the least of which is where the buck stops for mitigation and regulation. One thing is for sure, whatever the level of regulation, the risk from eating food and enjoying the great natural world will never be totally eliminated " (Gerald Manning *Dart Raffe Farm*, Witheridge Devon)

"On a personal level, I have found the research and the subsequent onward communication of the RELU programme to be highly effective…The highly relevant research on the use of animal manures on land and the potential risks to food safety is extremely important given the very large recalls of fresh produce that have occurred in the United States during 2008 following a Salmonella outbreak in humans." (David Gregory, Technical Director Marks and Spencer [now retired])

Soft networks (e.g. work shadowing, visiting fellowships)

- Work shadowing placements with Health Protection Agency and Defra Water Quality Policy division involving 3 project researchers (Chris Hodgson, David Oliver, Rob Fish)
- Microbiology undergraduate spent 8 weeks with post-doc researching FIO survival following slurry application to grassland. Paper published in 'Microbiologist' (v.8, p.49-50)
- Project team members also working together on a NERC Environment and Human Health Working Group 'Going Underground- Health Risks from Pathogens in the Soil-Water Environment'

Securing future impact (post-project/follow-on work)

- NERC small grant proposal submitted 'Re-shaping modelled approximations of faecal microbial die-off: the crucial importance of regrowth'
- Preparation of a BBSRC (responsive mode) proposal on 'The temporal and spatial variation of abiotic factors controlling die-off and re-growth dynamics of E.coli and intestinal enterococci in sheep and cattle faeces on pasture'
- Application for ESRC follow-on funding 'Mitigating diffuse microbial pollution from agricultural systems: Improving knowledge exchange using a combined on-farm risk and const management tool'
- All post-docs have continued in academia (1 as assistant professor at Kansas State University, 2 as senior research associates at the Centre for Sustainable Water Management at Lancaster University and 1 as a permanent researcher at North Wyke Research). 1 researcher remains at Exeter University
- North Wyke Research has increased its capacity for microbial pathogen research in the longer term, following the appointment of Chris Hodgson