



Rural Economy and Land Use Programme



Rural Economy and Land Use
Programme Briefing Series
No. 3
The Unfolding Research Agenda
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The Unfolding Research Agenda

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Foreword



The Rural Economy and Land Use Programme is carrying out interdisciplinary research on the multiple challenges facing rural areas.

The challenges being addressed include: restoring trust in food chains; tackling animal disease in a socially acceptable manner; sustaining agriculture in a liberalised economy; promoting robust rural economies; mitigating threats from climate change and invasive species; and reducing stress on water catchments.

Further details about the programme and on all the research can be found at <http://www.relu.ac.uk>

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Introduction

The Rural Economy and Land Use Programme (RELU) is a radically interdisciplinary programme, funded by the Economic and Social Research Council, the Biotechnology and Biological Sciences Research Council, Natural Environment Research Council, Scottish Executive Environment and Rural Affairs Department and the Department for Environment, Food and Rural Affairs. Every project funded combines social and natural science strengths. Projects encompass researchers from over 30 disciplines (Figure 1) and more than 50 institutions (Figure 2). A fundamental aim of the programme is to build the capacity to do interdisciplinary research in the long-term. Stakeholders are actively engaged at every stage of programme and project development.

There have been two rounds of funding so far (Figure 3). Under “Sustainable Food Chains”, eight 3-4 year projects, totalling £6M, began late 2004. Under “People and the Rural Environment”, 26 capacity building and scoping studies have already been completed, and eleven 2-5 year projects, totalling a further £6M, start early 2006. The third call for funding will be judged during 2006 and will include research on: the management of animal and plant disease; the analysis of the ‘urban footprint’ on rural infrastructure and ecosystem services; and the sustainability of rural settlement patterns and non-agricultural land uses.

“Issues of rural economy and land use cannot be explored in isolation. Cooperation between the Research Councils and their distinct scientific communities is imperative if we are to improve our understanding of the health, welfare and sustainability of the countryside.

Through the Rural Economy and Land Use Programme we are determined to support researchers in superseding the segmented disciplinary approaches of the past. Thereby, the analysis of social and economic behaviour should be combined with research on the ecology and biology of the natural environment.”

Professor Sir Howard Newby,
Chair of RELU Strategic Advisory Committee

Figure 1: Number of research investigators by discipline

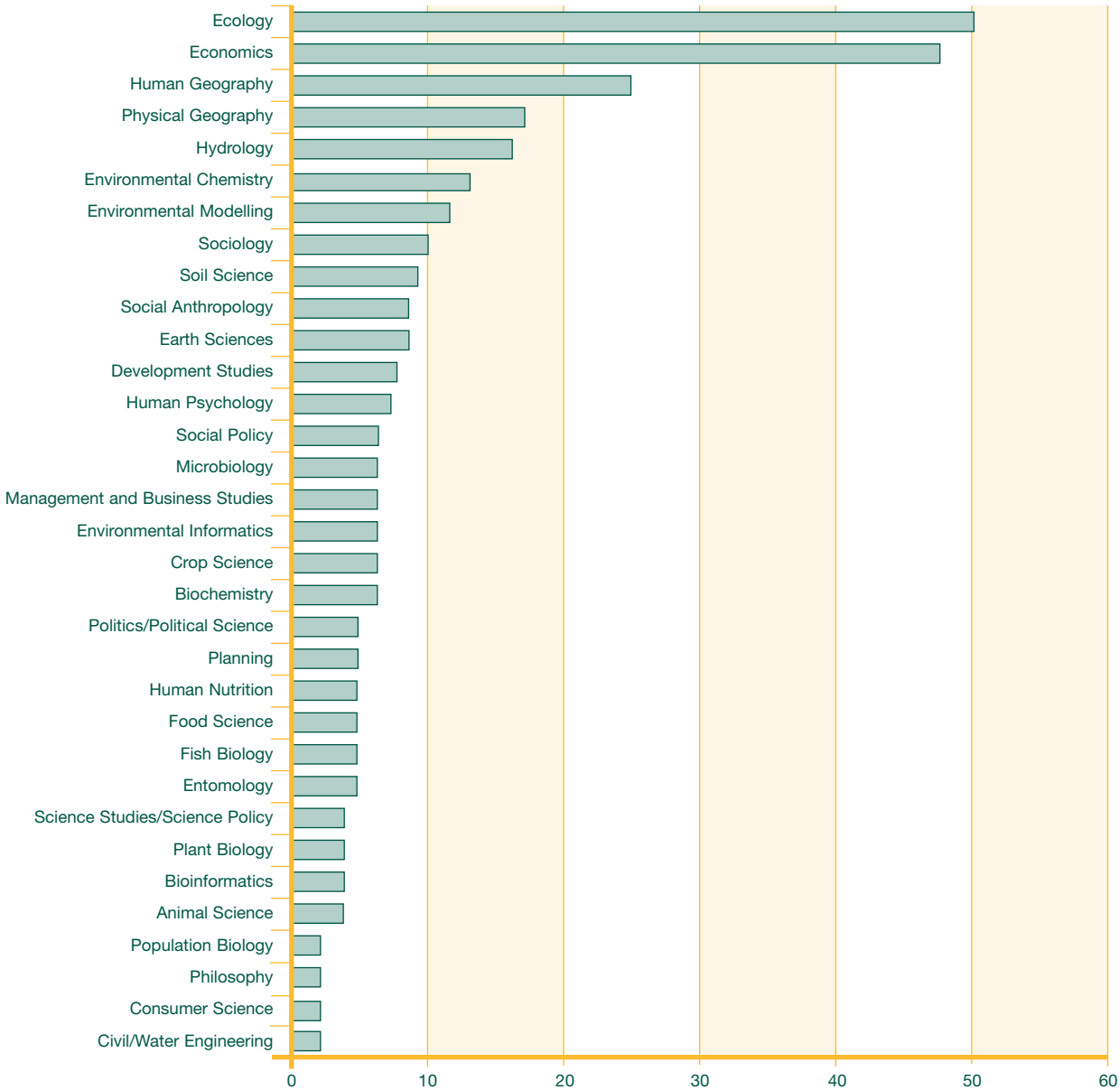




Figure 2: Institutions undertaking RELU research

UNIVERSITIES AND COLLEGES

University of Aberdeen
University of Bristol
University of Cambridge
Cranfield University
University of Dundee
University of Durham
University of East Anglia
University of Exeter
University of Glasgow
University of Gloucestershire
University of Hull

Kingston University
Lancaster University
University of Leeds
University of Leicester
University College London
Imperial College London
University of Manchester
Manchester Metropolitan University
Middlesex University
University of Newcastle
University of Nottingham

University of Oxford
Open University
University of Reading
Royal Agricultural College
University of Sheffield
University of Stirling
University of Surrey
University of Sussex
University of Wales, Aberystwyth
University of Wales, Bangor
University of Warwick
University of York

INSTITUTES

British Geological Survey
Central Science Laboratory
Centre for Ecology and Hydrology
Centre for Population Biology
Horticulture Research International
Macaulay Institute
Institute of Organic Research
Institute of Food Research
Institute of Grassland and Environmental Research
Rothamsted Research
Scottish Agricultural College
Silsoe Research Institute

OTHER

British Trust for Ornithology
Elm Farm Research Centre
Forest Research
Game Conservancy Trust
International Institute for Environment and Development
Vrije University Amsterdam

Sustainable Food Chains

Figure 3: RELU research themes

Research themes	Type of research project	Number of applications for research funding	Projects funded	Institutions funded
Sustainable Food Chains	Research Projects, to address the challenges facing agriculture and rural areas.	31	8	20
People and the Rural Environment	Awards of £200,000 - £1 million 3-5 years	89	11	30
The integration of land and water use The environmental basis of rural development Economic and social interactions with the rural environment	Capacity Building Awards and Scoping Studies: scope research and facilitate development of interdisciplinary research capacity. Development Activities: facilitate development of the programme and demonstrate its value and potential. Awards of up to £50,000 6-18 months	82	27 (completed)	40

Although advances in basic and strategic research have greatly expanded the potential to produce healthy food in an efficient and sustainable manner, the uptake and application of this research are subject to social and economic demands and concerns. High-profile controversies over GM crops, farming-and-food crises, food safety scares, and resource and habitat depletion have all affected public confidence in the technologies underpinning the food system and intensified awareness of the environmental and social costs associated with where food comes from and how it is produced. The public concerns and consumer anxieties are in turn influencing the markets for food products and the climate in which new technological developments are now promoted. In response, RELU research projects are adopting an integrated food chain approach to explore several research themes including risk, diet and health, and sustainable production systems.



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Risk

From farm to fork, risk is an inherent feature of the food chain. Risk issues range from contamination of water courses by farm run-off to consumers' concerns over food safety.



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In recent crises in food and agriculture (e.g. BSE, E. coli, Foot and Mouth Disease) a narrowly technical perspective has too often been taken: the social, political and economic issues have been addressed too late in the process with the result that many people lose confidence in what the authorities are doing. **Integration of Social and Natural Sciences to Develop Improved Tools for Assessing and Managing Food Chain Risks Affecting the Rural Economy** is a multidisciplinary project that is incorporating the thinking and values of stakeholders into the scientific modelling of such risks. The research is centred on three contrasting case studies: a chemical contamination, a microbial contamination and a mock crisis scenario. The project is developing ways to handle uncertainties in the estimates of risk, taking account of the complexity of contemporary food chains and the possible reactions of consumers to information on food safety. Various groups, including producers, NGOs, regulators, risk managers and members of the public, are helping define the problem and discussing their understanding of risk. This will enable examination of the effectiveness of different forms of risk communication.

Professor Richard Shepherd, University of Surrey r.shepherd@surrey.ac.uk

Dairy and beef farmers provide consumers with reliable sources of milk and meat, but the animal waste generated poses environmental and social risks. The project **Sustainable and Holistic Food Chains for Recycling Livestock Waste to Land** is evaluating the changes needed in management practices to limit the risk of pathogen transfers from grazing livestock, manures and other farm wastes to water courses. The effect of these changes on the economics and practicalities of farming are being investigated as well as the 'knock-on' effects for local communities and industries reliant on clean water supplies.

Research to date has focussed on determining current farm management practices in the Taw catchment in Devon. A core aspect of the work is the development of an index to assess the risk of pathogen transfers from farms to the environment. A consortium of experts is helping to assess the relative contribution of pathogen sources within the farming landscape, the processes by which they are mobilised and the hydrological links connecting sources of pathogens to water courses. The approach will be tested initially on ten farms that will be monitored to determine what risk of pathogen transfer they pose and to assess the effectiveness of different management measures to reduce this risk.

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Diet and health

Diet has been linked to many of today's most prominent public health problems such as type II diabetes, high blood pressure, heart disease and a range of cancers. Recommendations for healthy eating include the need to consume more fruit and vegetables (5 a day) and less saturated fat, especially saturated fats of livestock origin (meat and dairy products).

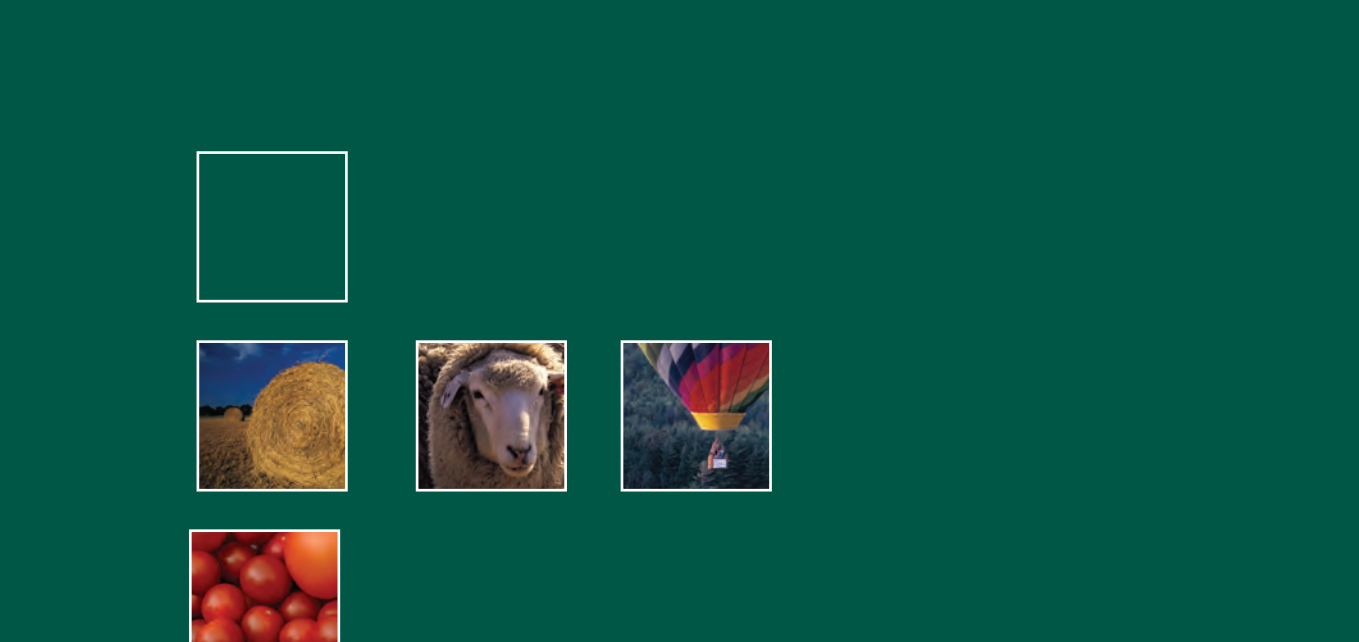
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The research being undertaken at Reading, **Implications of a Nutrition Driven Food Policy for Land Use and the Rural Environment** draws on a unique set of disciplines - economics, psychology, ecology, crop science, animal science and human diet and health - to assess the potential for improvements in the nutritional quality of soft fruit, lettuce, and meat and milk, and the possible implications for both human health and the countryside.

Soft fruit (strawberries, blueberries and raspberries) and lettuce are increasingly grown in polythene tunnels. The research team are assessing the extent to which new ultra-violet transparent films enhance the levels of phytochemicals, known to have antioxidant (cancer protecting) properties, in these crops. In addition, it is well known that milk and meat from grass-fed animals have a lower proportion of saturated fat and more of the beneficial n-3 fats than animals fed concentrates. The team are testing the hypothesis that more biologically diverse pastures for cattle will enhance these effects.

However, there is also the question of whether consumer demand exists for these products. The research is investigating consumers' attitudes towards and their willingness to pay for such healthier foods, as well as their response to possible policy interventions to promote healthy eating. The results will allow assessment of the potential benefits to consumers and public health and the impacts on the rural landscape.

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Currently substantial quantities of the vegetables we need are imported into the UK from around the world. Research at the University of Bangor is providing a **Comparative Assessment of Environmental, Community and Nutritional Impacts of Consuming Vegetables Produced Locally and Overseas.**

The research team are comparing local and imported vegetables for their social costs, carbon budgets, consumer acceptability, and health impacts. Fieldwork is being carried out in Kenya, Spain and the UK with a variety of vegetables, including beans, peas, brassicas, leafy/salad vegetables, potatoes and onions.

The environmental costs of the greenhouse gases produced during growth and transport of the crops as well as downstream costs of production, transport (food miles) and storage are being brought together in a Life Cycle Analysis (LCA) of vegetables from different sources. This will help determine which system has the lowest environmental impacts.

Sociological field work is also examining the local food cultures of different regions in the UK as well as consumer perceptions of health benefits of local and imported vegetables. A case study in Anglesey will help determine the advantages and disadvantages, environmentally and socially, of increasing local production of vegetables.

Early results suggest that issues of food sourcing are far more complicated than simply 'food miles', and that the purchasing pattern of consumers can have major implications both for the climate and for local economic development and poverty alleviation in developing countries.

Professor Gareth Edwards-Jones,
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Sustainable production systems

In increasingly competitive markets, many food producers aim to specialise on quality products. For their part, discerning consumers are anxious to know where their food has come from and whether it has been produced sustainably.

Eating Biodiversity: An Investigation of the Links between Quality Food Production and Biodiversity Protection is examining how environmental conservation of grasslands can be maintained and encouraged by linking it with the production and marketing of high quality food. The project is working closely with a number of initiatives managing semi-natural grassland, as well as with specialist producers and suppliers of animals raised on biodiverse vegetation.

Research so far has focused upon the lamb supply chain, from sheep grazed on salt marsh, and heather and grass moorland. Habitat type and meat quality and taste have been characterised for a number of sites. In addition, consumer focus groups are being consulted to determine their willingness to pay for products encouraging environmental quality. The work aims to clarify the potential gains in farm income, food quality, and conservation from better marketing of the products of grazing-land biodiversity. The field work is being carried out in the UK, and research will continue on beef and cheese. Parallel developments in France are being followed and will help inform recommendations on appropriate branding, business infrastructure and farm advice.

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Tilapia is a warm water fish with firm, white flesh and a mild taste very similar to a cod or haddock. It is a favoured rural diversification option in many developing countries, but in recent years it has found a market in Developed countries too. Tilapia is a hardy, fast growing fish and unlike other fish farmed in the UK, it can thrive on an herbivorous diet. It is, therefore, thought to be highly suitable for low cost aquaculture with the potential to be a more sustainable source of food with fewer environmental impacts than other farmed or wild caught fish. The project **Warmwater Fish Production as a Niche Production and Market Diversification Strategy for Organic Arable Farmers** aims to develop technical guidelines for a sustainable system for tilapia culture as a potential diversification strategy for farmers in the UK. A comprehensive analysis of the practicality, sustainability and viability of the system is being gained through laboratory and on-site investigations and trials with two commercial partners.



The team is using consumer focus groups to examine the acceptance of tilapia with numerous niche markets alongside the food service market. Transferring an alternative production system from the Developing to the Developed World involves institutional change as well as innovations in farming systems and technologies. For example, the team is pioneering the formulation of appropriate guidelines for organic certification of farmed fish with the Soil Association.

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There is a real need to develop alternatives to chemical pesticides for sustainable farming, due to the increasing development of pesticide resistance and concerns about safety and protecting the environment. These concerns have largely been about the safety of pesticide residues in food and recently attention has been drawn to possible health issues arising from spray drift. One approach to reducing dependence on chemical pesticides is the promotion of naturally occurring organisms as pest control agents, but the rate of commercialisation of such bio-pesticides has been low. Two RELU projects are addressing the opportunities and obstacles from complementary angles.

The project **Biological Alternatives to Chemical Pesticide Inputs in the Food Chain: An Assessment of Environmental and Regulatory Sustainability** is examining the rules governing the introduction of pest control agents in the UK, Europe and the USA to assess whether changes in regulations might encourage a move towards bio-pesticide use.

The project is based on insect pathogenic fungi, which are naturally widespread in the environment and can be used to control insect pests of crop plants. Fungal bio-pesticides have been produced in the past, although little work has been done on their environmental sustainability. The team's results on insect pathogenic fungi indicate that they are adapted by genetic group to particular types of habitat. This is likely to be an important determinant of the ability of naturally occurring fungi to compete with bio-pesticide strains released into the environment.

The arrangements for regulating pesticides are in transition with the EU taking an increasing role in rule setting but with implementation remaining the responsibility of national agencies, in the UK by the Pesticides Safety Directorate (PSD). So far in the project several preliminary conclusions have been drawn for regulatory policy. The research suggests, for example, that the requirement for efficacy testing of bio-pesticides (whether they work rather than whether they are safe) should be reviewed in the light of experience in the USA where such

considerations are left to the market. In addition, the project is drawing attention to the need for refinement to the system of mutual recognition in the EU, whereby a product approved by a member state needs to be approved in all states, with indications that careful changes are needed to help this operate more effectively.

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The project **Re-Bugging the System: Promoting Adoption of Alternative Pest Management Strategies in Field Crop Systems** is investigating both the efficacy of alternatives to chemical pesticides and issues for producers in switching to them. Two alternatives are being explored: habitat manipulations to encourage predators and parasites, and semio-chemical odours (natural smells) to manipulate predator distribution. The aim is an improved research and development framework to help break pesticide dependency and support alternative pest control technologies.

The team has been examining effects of predators on aphid numbers in cereal crops. They have already shown that the use of semio-chemicals in combination with certain habitats surrounding arable fields, including beetle banks and field margins, will encourage the presence of predators and thus help protect crops from aphid damage. This work will help advise farmers on which types of cover to plant in order to gain the best pest control and help identify effective Integrated Pest Management (IPM) strategies.

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People and the Rural Environment

Eleven large research projects, beginning in 2006, are addressing RELU's other three key themes: Integration of land and water use; Environmental basis of rural development; and the Economic and social interactions with the rural environment.

Integration of land and water use

RELU projects are conducting interdisciplinary research to understand the obstacles to, and means of, achieving sustainable land and water use. Specific problems include over abstraction, flooding, erosion, siltation, diffuse agricultural pollution, eutrophication and loss of biodiversity. An integrated approach to the management of land and water resources and the minimisation of emissions is needed to meet, in particular, the challenges presented by the Water Framework Directive and the opportunities opened up by reform of the Common Agricultural Policy.

The project **Catchment Hydrology, Resources, Economics and Management** is developing a hydrological-economic model to assess the costs and benefits of changing farming practices in the Humber catchment area in order to produce a healthy river environment with good amenity value in keeping with the Water Framework Directive. The modelling will seek to anticipate the effects of both CAP reform and climate change. A novel feature will be surveys of farmer decision making to provide guidance on alternative strategies and to estimate the consequences for farm incomes and fragile rural economies.

Professor Ian Bateman, University of East Anglia i.bateman@uea.ac.uk

Agricultural Flood Defence Schemes in floodplain and coastal areas were once an important element of Government support for farmers. However concern over environmental quality and increased sensitivity towards flood risks and their effects on non-farming interests have promoted a re-appraisal of land management options and policies. **Integrated Land and Water Management in Floodplains** will explore changes that have occurred over the last 40 years in areas which were 'defended' under flood defence schemes. Case studies of selected schemes, first studied by the research team in the early 1980s, will show how land use has changed in the meantime and the consequences for livelihoods and the management of flooding problems. The project will help inform decisions about the future management of floodplains.

Professor Joseph Morris, Cranfield University j.morris@cranfield.ac.uk

Environmental controversies not only lead to the questioning of science but also clashes between different sources of expertise. **Knowledge Controversies in Rural Land Management: Science, Democracy and Environmental Expertise** will explore how science is understood and accepted or challenged by policy makers and wider publics. The research will analyse the process of scientific knowledge production in environmental controversies, using flooding as a case study. The focus will be on how environmental science is produced, used and disputed. The project sets out to develop a different way of 'doing science' that involves social and natural scientists working together, and with local people, in what are called 'Competency Groups'.

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Environmental basis of rural development

Local and regional government and development and conservation agencies are increasingly concerned with harnessing the complex contributions that rural landscapes and environments can make to the quality of life and competitiveness of regions. Rural areas have crucial roles to play, apart from food production, in nature conservation, forestry, the production of energy and non-food crops, and the management of waste. However the ecological and economic feasibility and social acceptability of these roles cannot be taken for granted. RELU research is, therefore, exploring how to achieve a sound environmental foundation for rural conservation and regeneration.

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Traditional farming in Europe produced landscapes which supported a rich variety of plants and animals. However technological intensification in the 20th Century led to huge declines of wildlife. The study **Improving the Success of Agri-Environment Initiatives: The Role of Farmer Learning and Landscape Context** will examine how well wildlife habitats are created under agri-environment schemes, the predominant strategy to counteract wildlife decline in Europe. These schemes have had limited effects, possibly because of a combination of less than optimal management by landowners and the inability of plants and animals to colonise new habitats due to their rarity or obstacles to their movement in the landscape. Researchers will examine the effects of training on farmers as well as the availability of different species and habitat types in the wider landscape, to enhance the biodiversity benefits of agri-environment schemes.

Dr James Bullock, CEH Dorset jmbul@ceh.ac.uk

The variation in management of farms is also a key determinant of biodiversity differences. **Evaluating the Options for Combining Economically, Socially and Ecologically Sustainable Agriculture** will link together models of the dynamics of weed and bird populations and farm management decision making in order to understand the great variability of arable farming practices and intensities and their implications for farm livelihoods and biodiversity. The work will be used to determine the best ways of targeting agri-environment schemes to achieve the government's objectives to reverse the decline of wildlife in the countryside.

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© Countryside Agency, Rob Pilgrim

Hill farming works with moorlands that host species of international conservation concern and provide landscapes of high recreational value. Taking the Peak District as a case study, the project **A Landscape-scale Analysis of the Sustainability of the Hill Farming Economy and Impact of Farm Production Decisions on Upland Landscapes and Biodiversity** will examine how farmers are likely to respond to the major changes that the CAP is undergoing. The effects on the uplands and its wildlife will depend not just on individual farming decisions but on the interactions between ecological and economic factors at a larger scale. Ecological-economic models will be set up to anticipate these wider effects and to evaluate the capability of farm-level policy interventions to satisfy the multiple demands on moorlands.

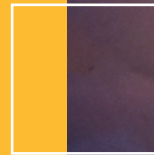
Dr Paul Armsworth, University of Sheffield
p.armsworth@sheffield.ac.uk

One type of wildlife that is noticeably expanding is deer. Britain's deer population is growing, including non-native species that are spreading across the countryside. The effects are certainly not welcome by everyone, with increased concerns over road traffic accidents caused by deer, economic losses to forestry, agriculture and horticulture, competition with other wildlife, and potential risks to public health. Deer also present, as yet, unrealised potential for income generation from stalking, venison production and wildlife tourism. The management of deer thus provides an ideal case study on how to reconcile the different perspectives of those who make their living from the countryside and on how to make best use of the same ecological resource. The project **Collaborative Frameworks in Land Management: A Case Study on Integrated Deer Management** will therefore investigate how well interests and organisations involved in deer management work together and how this can be improved so that the costs of managing deer are minimised and the benefits maximised. It will specifically identify what barriers hinder collaborative resource management and how they can be overcome.

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The shift from conventional to organic farming may have significant consequences for wildlife and soil and water quality, for the ways in which food is supplied, and the economics of farm businesses. What is little understood is how these potential impacts depend on the scale and concentration of organic farming systems across the landscape. The project **An Integrated Analysis of Scale Effects in Alternative Agricultural Systems** will undertake an integrated assessment of scale effects by studying matched sets of farms situated in landscapes with high and low concentrations of organic farming to determine the positive and negative effects that different patterns of organic cultivation may have. The work will result in alternative scenarios for development of the organic sector in the UK.

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The government is keen to see a major expansion of energy crops. To be viable this will need to be done in geographical concentrations. The decisions on appropriate areas is likely to be based on considerations of climate, soil type and water availability that would ensure good growing conditions. However, it is not clear how such considerations should be balanced against the possible impacts on the environment and the rural economy and the public acceptability of the consequent changes to the countryside. The project **Social, Economic and Environmental Implications of Increasing Rural Land Use Under Energy Crops** will develop an integrated framework for Sustainability Appraisal of the medium and long term conversion of land to energy crops. The project is benefiting from the involvement of the Regional Development Agencies for the East Midlands and South West England, used as study areas, as well as industry representatives and the Department for Environment, Food and Rural Affairs.

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Economic and social interactions with the rural environment

Rural landscapes have evolved through centuries of economic change and population movement, and will continue to do so. While some areas face the prospects of depopulation, other areas face continuing development pressures and potentially competing demands on the countryside: for employment, for space and facilities for leisure, and for extensive land uses. Research under the programme is exploring the changing social and economic functions of the countryside in order to understand what shapes these changing roles, assess their environmental consequences and identify means of managing them sustainably.

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Much of Britain's drinking water comes from the uplands. They are also important for tourism, livestock rearing, nature conservation, game management, fishing, and are home to people who still make a living from the land. The project **Managing Uncertainty in Dynamic Socio-Environmental Systems: An Application to UK Uplands** focuses on the Peak District National Park. It seeks to encompass the diverse pressures on land use and livelihoods, as well as the range of visions for a sustainable future held by those who live and work in the Park. Natural and social scientists are joining forces with local people and policy makers in an adaptive learning process based on a model that will integrate different perceptions and knowledge to enable discussion of future land management scenarios. This will help people identify the most appropriate ways to adapt to change in upland areas in a socially and environmentally sustainable way and to monitor their progress in doing so.

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Nearly 4 million anglers spend an estimated £6 billion on their sport every year. While angling makes an increasingly important contribution to the sustainability of the rural economy, it is also important to sustain the river environment on which the sport depends. The project **Angling in the Rural Environment: Social, Economic, Ecological and Geomorphological Interactions** is focusing on three rivers in the north of England: the Esk, the Ure and the Swale, whose catchments are under various environmental pressures. It draws together natural and social scientists as well as stakeholders from government, NGOs, and local communities to explore the complex linkages between river, fishing, biodiversity and institutions of governance. Results will be used to influence practice and decision making for integrated management of the river environment.

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Summary

The Rural Economy and Land Use Programme

Harnessing the social and natural sciences for sustainable rural development

Through casting research in a broad social and economic framework, RELU is demonstrating a strategic potential to prioritise biological and environmental processes that underpin larger scale processes of sustainable development. In doing so, it is building new interdisciplinary capacity.

Between the natural, biological and social science communities the research is strengthening or forging links that were previously weak or non-existent. This is enabling cooperation on cross-cutting issues of critical importance concerning plant/animal and human interactions.

Working closely with stakeholders and policy makers at the programme level, as well as farmers, land managers and users of rural resources at the project level, the Programme is pioneering ways of addressing the multiple challenges facing the rural economy and landscape.



Links

Sustainable Food Chains

Integration of Social and Natural Sciences to Develop Improved Tools for Assessing and Managing Food Chain Risks Affecting the Rural Economy

<http://www.relu-risk.org.uk/>

Sustainable and Holistic Food Chains for Recycling Livestock Waste to Land

<http://www.lec.lancs.ac.uk/cswm/foodchains.htm>

Implications of a Nutrition Driven Food Policy for Land Use and the Rural Environment

<http://www.relu.rdg.ac.uk/>

Comparative Assessment of Environmental, Community and Nutritional Impacts of Consuming Vegetables Produced Locally and Overseas

<http://www.ifanc.bangor.ac.uk/relu.php>

Warmwater Fish Production as a Niche Production and Market Diversification Strategy for Organic Arable Farmers

<http://www.aquaculture.stir.ac.uk/Systems/TilapiaProject.htm>

Biological Alternatives to Chemical Pesticide Inputs in the Food Chain: An Assessment of Environmental and Regulatory Sustainability

<http://www2.warwick.ac.uk/fac/soc/pais/biopesticides/>

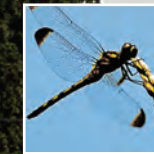
People and the Rural Environment

Managing Uncertainty in Dynamic Socio-Environmental Systems: An Application to UK Uplands

<http://www.env.leeds.ac.uk/~mreed/sustainableuplands/>

The Rural Economy and Land Use Programme

<http://www.relu.ac.uk>



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