

Reflexive Interdisciplinary Research: The Making of a Research Programme on the Rural Economy and Land Use

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Abstract

This paper provides an account of the origins and formation of the UK Research Councils' Rural Economy and Land Use (RELU) programme and its approach to promoting interdisciplinary working between social and natural scientists. The programme is set in the context of broader developments in science policy, including a policy discourse centred upon sustainable development and the knowledge economy and associated demands for greater accountability in science. Interdisciplinarity promises research that will be more relevant and responsive to public needs and concerns. In describing the provenance of the RELU programme, therefore, the paper seeks to lay out the different stages in its initiation and design to show how, to varying degrees, these were open to external scrutiny and influence. The process of developing the programme illustrates that it is not straightforward to make research agendas and funding more transparent and accountable. It also provides insights into the challenges that interdisciplinarity and accountability present to established science institutions.

Keywords: *Interdisciplinary research; rural economy and land use; science accountability; science policy.*

1. Introduction

The Rural Economy and Land Use (RELU) programme² is the most comprehensive interdisciplinary research initiative ever conducted by the UK Research

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² RELU is a £20 million initiative funded by the Economic and Social Research Council, Natural Environment Research Council and Biotechnology and Biological Sciences Research Council with additional funding from the Department for Environment, Food and Rural Affairs and the Scottish Executive, Environment and Rural Affairs Department.

Councils. RELU is committed to pursue interdisciplinary working across the social and natural sciences in every research project it funds. The programme – which runs between 2003 and 2010 and currently involves over 50 projects, 300 researchers and 50 institutions – aims to advance a holistic understanding of the major economic, social, environmental and technological challenges facing rural areas. RELU is built on two core premises. The first is that the salient challenges cut across disciplinary boundaries and that interdisciplinary research is required as a basis for sustainable rural development. The second is that to enhance the impact of research on policy and practice, the programme should engage potential stakeholders throughout all stages, including the identification of research questions, the conduct of the research and the dissemination of results.

Interdisciplinarity presumes and builds upon the existence of disciplines. Indeed, it is often portrayed as the essential counterpart to the competing perspectives of disciplinary specialisation. Some commentators thus refer to interdisciplinarity as a complex and ever-evolving reel of the disciplines, in which the tensions between the ‘inner development’ of science and the on-going maturing, differentiation, cross-fertilisation and merging of scientific disciplines are played out. Through this dynamic, the fluid and networked nature of scientific knowledge is maintained (Abbott, 2001; Klein, 2004).

In recent years, the demands for interdisciplinary research have mounted, but they have also changed qualitatively. In Strathern’s words, they have become ‘hyper-formalised’ (Strathern, 2004), as interdisciplinarity has become not only an explicit objective of research funding, but also a key means of generating science policy. Some commentators see this as part of a broader transformation in the nature of scientific knowledge and its relationship with society. A shift in the development of knowledge is discerned from being linear, hierarchical, compartmentalised and distinct from society to being open, networked, permeable and without rigid government (Nowotny *et al.*, 2001; Klein, 2004; Rhoten, 2004). The expectation is that science should consequently be both more relevant and more responsive. Thus, on the one hand, interdisciplinarity presents itself as an agenda-setting mechanism in directing research to real-world problems; and, on the other hand, interdisciplinarity grapples with demands for greater public accountability in science.

In this paper we introduce the RELU programme and, in describing its origins and formation, we reveal how it has sought to address the reciprocal demands for agenda setting and accountability. We begin by charting how the programme appeared as part of a wider demand for interdisciplinary research from within two broad areas of policy discourse, concerning sustainable development and the knowledge economy, and associated demands for greater accountability of science. In keeping with the spirit of openness and reflexivity, we then discuss the decisions that shaped the initiation and design of the programme, the extent to which they opened up or closed down research framings, and their receptiveness to non-academic influences and priorities.

2. The Demand for Interdisciplinary Research and Science Accountability

Interdisciplinarity has been given ever more attention in science policy. According to the UK Science and Innovation Framework, ‘over the next decade many of

the grand challenges in research will occupy the interfaces between separate research disciplines developed in the 19th and 20th centuries' (HM Treasury, Department for Education and Skills and Department of Trade and Industry, 2004, p. 14). Interdisciplinary research in essence aims to avoid partial framings of problems. Attention has frequently been drawn to the limits of disciplinary perspectives and their implicit, but naïve, understanding of the world beyond (Clark and Lowe, 1992). A simplistic sociology or economics often pervades scientists' conceptions of society. Equally, social scientists incorporate into their analyses naïve models of environmental and technological systems. Klein (1990) describes interdisciplinarity as a means of addressing a question or solving a problem that is too broad to be handled adequately by a single discipline. Specifically, it is seen to be necessary to understanding the (non-linear) dynamics, uncertainties, multiple dimensions and interrelationships of complex systems (Capra, 1996).

Interdisciplinarity differs from disciplinarity and multidisciplinarity in the emphasis it places on interaction and joint working, which brings the knowledge claims and conventions of different disciplines into a dialogue with each other, yielding new framings of research problems. This can have varied outcomes, including the augmentation or reinterpretation of data and findings, the transfer of methods and techniques, the cross-fertilisation of models and agendas, even the establishment of new sub-disciplines.

These promises of tackling complex systems and facilitating innovation in knowledge production have led to increasing emphasis on interdisciplinarity not only as an objective of research projects and programmes, but also as a strategic means for coordinating and refocusing the science base. Indeed, interdisciplinarity has become a master steering mechanism in government science policy. As the Office of Science and Technology, which oversees the UK's Research Councils, has commented:

'Much of the most innovative work in science is being done at the boundaries between traditional subject areas. Collaboration between Councils to develop frontier research is increasingly important. Each Research Council is increasingly dependent in its core research on the skills of disciplines supported primarily by other Councils, and many research areas straddle the territory of several Councils and require collaboration. ... More collective strategic leadership and cross-Council working is needed if the UK science base is to deliver its full potential and be able to compete internationally' (Office of Science and Technology, 2001, p. 21 and 23).

Governments have looked towards targeted investment in scientific capacity as a medium and long-term driver of national economies. To the established binary system of classifying research as 'basic' or 'applied' has been added the third category of 'strategic', to signify investment in science that is socially or economically relevant but not with immediate commercial potential. Interdisciplinarity provides a means for steering and coordinating strategic investment in research across a range of partners – as funders, suppliers and potential users of the science – including the Research Councils, the Universities, government agencies and industry.

The 'knowledge economy' agenda gained particular purchase in the UK under the 'New Labour' Government which came to power in 1997 and which sought to promote coordinated investment and exchange between the UK's science and indus-

trial bases (Jacob and Hellstrom, 2000; Cooke, 2002). The closer collaboration between academic and commercial interests is itself seen as enabling the generation of novel fields of research and application, fusing together different elements of existing and emerging expertise. Here interdisciplinarity holds out the promise of fostering whole new 'high-tech sectors' – from biotechnology to nanotechnology – based on cutting-edge science.

Partly in response to the appropriation of science into the knowledge economy and the fact that research is increasingly conducted within partnerships comprising the public and private sectors, there have been parallel calls for research decision-making and agenda setting to be more transparent and responsive to public concerns and priorities (House of Lords Science and Technology Select Committee, 2000). These calls to 'democratise' science have been particularly strident in the food and agricultural fields (Food Ethics Council, 2004) where a technology-driven model of production has provoked deepening public opposition and consumer mistrust for its environmental, health and ethical impacts (Lowe, 1992; Jasanoff, 1997; Miles *et al.*, 2004). Twin demands have thus arisen: that civil society be involved upstream in the strategic steering of research initiatives; and that social and environmental perspectives be brought to bear on the framing of technical research agendas. On the one hand, therefore, new methods of engagement and governance are sought that can expose to public scrutiny the values and assumptions that get built into research ventures (Nowotny, 2003; Food Ethics Council, 2004; Agriculture and Environment Biotechnology Commission, 2005). On the other hand, the scope of interdisciplinarity is broadened to embrace both the social and natural sciences, to ensure that scientific and technological opportunities and constraints are understood in their appropriate social and environmental contexts.

These various demands have become particularly focussed on the research requirements of sustainable development – what is sometimes referred to as sustainability science (Kates *et al.*, 2001). Unsustainable development is seen as an indictment of narrow expertise and the single-minded pursuit of technology. Holistic solutions, in contrast, combine adaptations in socio-technical, ecological and biological systems. According to a former UK Minister for the Environment: 'The main reason we are in our current mess is that we have been too blinkered in our approach: by focusing our objectives too narrowly, we have caused unexpected ... problems elsewhere. Research that is going to make a full contribution to sustainable development needs to be set in a broader context. It will often require collaboration between several academic disciplines' (Policy Studies Institute, 2002, p. 1). The Government's science strategy for sustainable development identifies a multidisciplinary approach as one of its central principles (Department for Environment, Food and Rural Affairs, 2003). Interdisciplinary research thus meets increasing demands from public interest groups, policy-makers and stakeholders for more integrated perspectives. As Klein comments:

'Sustainability is a major testing ground for integrating science with both humanities and social sciences. Traditionally, natural sciences have dominated environmental research. Social science approaches have not been incorporated into the mainstream of environmental research and environmental considerations are still excluded from the mainstream of social science. ... Strategies are needed to enhance the ability of key social actors to move towards more sustainable practices through transforma-

tions that incorporate knowledge about the behaviour of strongly coupled social and ecological systems' (Klein, 2004, p. 7).

The radically inclusive and reflexive³ notion of interdisciplinarity that embraces both social and natural sciences potentially also responds to demands for more accountable science, i.e., science that is more responsive to societal concerns and priorities. But how does it do these things compared with science operating in a traditional disciplinary mode? There are several potential lines of argument. One follows the logic of sustainability science in calling for social considerations to be addressed in the research process alongside technical specifications. Another line of argument sees overcoming communication difficulties between disciplines as opening up broader possibilities of engaging with non-scientists also. In Strathern's words, 'reaching beyond disciplines merges with reaching beyond academia' (Strathern, 2004, p. 72).

A third line of argument relates to the process of problem specification. The interdisciplinary vs. disciplinary perspective is often portrayed simply as a tension between an *external-problem-driven science* and an *inner-logic-driven science*. In keeping with that formulation, disciplinary defenders argue that societal issues are not self-defining, and that it is disciplines that render them into tractable scientific problems. Thus, the scientific framing of problems is necessarily a disciplinary prerogative. This seems a powerful argument, which would imply that it is discipline-based characterisations of problems that are the crucial step in research agenda setting (Shove and Wouters, 2005). In contrast, advocates of interdisciplinarity argue that scientific disciplines cannot be left alone to determine research priorities because the assertion of disciplinary authority in research agenda setting suffers from a serious flaw. Different disciplines will put forward their distinct perspectives on a particular issue, but, to arbitrate their mutually exclusive knowledge claims, extra-disciplinary judgements are needed. For example, is overfishing an ecological problem or an economic problem? Is the slow uptake of biopesticides a behavioural, an institutional or a bio-technical problem? Disciplines have a self-interest in their problem diagnosis being accepted as the definitive one, and therefore cannot be trusted to be disinterested in asserting their claims to characterise a societal issue.

Both disciplinary and interdisciplinary research need to go through two processes to resolve these conundrums: one is resource allocation and the other is scientific-problem specification. The sequencing of these processes is different between disciplinary and interdisciplinary research, with expert closure in problem specification occurring at an earlier or later stage as a consequence. Disciplinary science needs prior allocations of institutional resources, scientific labour, research infrastructure and funds, across scientific fields. These allocations – carried out by governments, commercial organisations, universities, research funding bodies, etc. – are based on 'extra-disciplinary' assumptions about the potential of different disciplines to contribute to wider social, commercial or institutional imperatives. Within

³ The paper is in itself a reflexive piece which aims to reflect upon, and put on record, the processes behind the efforts to set up the programme. Our argument is that interdisciplinarity is also an implicitly reflexive approach, given that it casts the spotlight (of researchers and potentially other social actors) on the research and problem-framing process and calls for (self-) reflection on one's own disciplinary perspective and that of other disciplines.

particular fields, scientific communities can then frame and prioritise research problems according to their own disciplinary logic. Resource allocation and problem specification are thus demarcated, preserving a sense of the autonomy of science. Within an interdisciplinary programme, in contrast, the different disciplines' framings of the particular research problem have to be confronted and compared before, as well as after, resource allocation. Without disciplinary closure, there is scope for external and normative influences to be brought to bear in considering the relative merits of different disciplinary perspectives and how these should be combined in problem specification. The window of opportunity for engaging broader social interests in the framing of research problems is thereby extended.

3. The Genesis of RELU: Agenda Setting and Accountability

The decisions that shaped the RELU programme can be considered at various stages in its genesis: the origination of the programme, the formulation of its objectives, programme specification, proposal selection and the projects themselves. We will consider these stages briefly in turn, to identify the extent to which each opened up or closed down research agendas and framings, and was shaped by narrower or broader sets of interests.

3.1. Origination of the programme

The RELU programme arose at a particular moment in time in the relationship between the Research Councils and Government. Through successive, multi-annual spending reviews, the UK Government had been seeking to be more strategic in enrolling the science base in its knowledge economy agenda. The Research Councils, interested in tapping into additional monies ring fenced within the science budget for strategic investments, were eager to respond. As part of the 2002 Spending Review, the Research Councils identified a range of new areas for research investment, including the *rural economy and land use* (RELU) to which the Office for Science and Technology (OST) allocated £20 million. The process by which topics such as this are initiated and progressed through the system is essentially officer led within the Research Councils, with some limited consultation with scientific leaders and sourcing of expert opinion. The process is competitive between suggested initiatives as well as between the Research Councils themselves. Candidate investments are strengthened and taken forward, or eliminated, through successive stages of discussions within the Research Councils, the Office for Science and Technology, the Department of Trade and Industry (the parent Department for OST) and the Treasury. Their progress through these stages depends on the extent to which the promoters of the initiatives can show how they respond to broader political and public priorities and how they demonstrate strategic collaboration across the Councils.

The RELU programme was established in a context of major policy and institutional developments that together represented a qualitative change in the way that government thought about and dealt with rural issues and which in turn demanded an accompanying step change in research. The UK Government had taken a strategic lead in the reform of the Common Agricultural Policy towards the liberalisation of agricultural trade and a shift from subsidising farm production to support for environmental management and rural development. On the one hand, this raised

questions concerning the competitiveness of rural areas in a globalised economy and the responsiveness of farming to consumer demands. On the other hand, public policy for the countryside faced growing pressures, including how to stem the decline in farmland biodiversity, how to combat diffuse pollution from agriculture, how to adapt the management of rural land to climate change and how to accommodate the growing demand for non-agricultural uses of rural land (Performance and Innovation Unit, 1999; Department of the Environment, Transport and the Regions and Ministry of Agriculture, Fisheries and Food, 2000). Crucially, a series of policy crises, including BSE (Bovine Spongiform Encephalopathy), the Foot and Mouth Disease epidemic and the opposition to genetically modified (GM) crops, had both redirected attention towards public-interest science and reinforced arguments for more joined-up approaches to rural policy (in England this was encapsulated in 2001 by the replacement of the Ministry of Agriculture, Fisheries and Food by the Department for Environment, Food and Rural Affairs). Together these changes reflected reorientations in the broader framing of public policy – from primary production to sustainable development, from a production-driven logic to one more oriented to the consumer, and from a sectoral to a territorial outlook in the management of rural areas – which in turn demanded an accompanying shift in the research base.

In the event, and although it remained very broad and loosely defined, RELU was considered as a strategically important initiative both from the point of view of public policy development and Research Council cooperation. In terms of inter-Council cooperation, it brought together the Economic and Social Research Council (ESRC), the Biotechnology and Biological Sciences Research Council (BBSRC) and the Natural Environment Research Council (NERC). In the past, cooperation, particularly between the first two Councils, had been limited. The ESRC was given the lead role, which assured the social sciences the position of *primum inter pares* within the programme. This departed radically from the ‘end-of-pipe’ role conventionally accorded to social scientists in technical programmes, of helping to overcome social constraints to advances in science and technology. The programme therefore held out the promise of bringing critical social perspectives to bear on technical research agendas and of promoting understanding of technological opportunities and environmental constraints in their appropriate social and economic contexts.

3.2. Formulation of programme objectives

The scientific objectives of the programme are set out in Table 1, as formulated by the officers of the Research Councils. Lying behind these objectives was the decision to pool the resources for RELU from the three participating Councils within a single budget and the related decision to require all projects funded to be interdisciplinary. These broad structural parameters were decided in the context of the drive for more joined-up science. Although very challenging and laid down by the Research Councils, their effects in terms of subject matter or approach to interdisciplinarity remained wholly unprescribed. The decisions did not predetermine particular disciplinary collaborations, but radically opened up the field to any conceivable coupling of social and natural sciences.

The decisions on the programme’s interdisciplinary objectives were shaped by the history of inter-Research Council cooperation in this field. Some of the officers had had experience of a predecessor programme of 10 years earlier (the Joint Agricul-

Table 1

The objectives of the Rural Economy and Land Use (RELU) programme

Science objective

To deliver integrative, interdisciplinary research of high quality that will advance understanding of the social, economic, environmental and technological challenges faced by rural areas and the relationship between them.

Capacity-building objective

To enhance and expand capabilities for integrative, interdisciplinary research on rural issues.

Knowledge transfer objective

To enhance the impact of research on rural policy and practice by involving stakeholders in all stages of RELU, including programme development, research activities and communication of outcomes.

ture and Environment Programme, JAEP), which had demonstrated the limitations of a multidisciplinary programme. JAEP had involved the same three Research Councils, but the collaboration between them had been weak. Indeed, they had divided the programme budget between them and had operated three separate strands of research.⁴ This division of resources and decision-making has been associated with poorly integrated research outcomes and perspectives. Disappointment with the overall achievement and impact of JAEP cast a shadow over inter-Research Council cooperation over the following years.⁵ A wish to avoid a similar fate was behind the commitment to a central pot and process. RELU had been sold to the OST and Treasury as a genuine collaboration and it was understood that these powerful actors expected an integrated programme and outcomes. A Strategic Advisory Committee (SAC) was appointed under the chairmanship of Sir Howard Newby, the Chief Executive of the Higher Education Funding Council for England and a former Chief Executive of the ESRC, and comprising senior scientists from each of the three constituent research communities plus representatives of major

⁴The Joint Agriculture and Environment Programme ran between 1989 and 1994 following the award of £5.4 million for the programme from the Agriculture and Food Research Council, Economic and Social Research Council and Natural Environment Research Council. The money was divided between the three research councils and funded three strands of research: on plant/herbivore interactions and vegetation dynamics; changing farm economies and their environmental relationships; and ecology of farmland. In all, 36 projects were funded (AFRC, ESRC and NERC, 1994).

⁵It is notable that there was very little cooperation at all between ESRC and BBSRC over the following 10 years. In terms of environmental research, the Research Councils largely went their separate ways in the 1990s with each staking their own particular claims for research leadership (ESRC ran its own Global Environmental Change programme and NERC its own Urban Regeneration and the Environment programme). Howard Newby, who was Chairman of ESRC between 1988 and 1994 and Chief Executive in 1994, commented 'There is a lot of goodwill between the research councils to encourage greater co-operation [between social and natural scientists]. There is even a fair amount of understanding that each others problems are important. But however much goodwill and mutual understanding there is, it all seems somehow to slip through our fingers when we come to devising some common endeavour' (Newby, 1993).

public sector stakeholders. Its role was to oversee the direction of the programme, and the Research Councils delegated to it the authority to appoint a Programme Director and to decide the content and timing of the calls for research bids and the balance and emphasis of resources across the programme.

This pooling of resources represented an important institutional innovation within the Research Councils. To operationalise this arrangement, and to provide a supportive framework for interdisciplinary research, further innovations at programme management level followed, such as the development of bespoke cross-Council approaches and procedures for grant applications and assessment and the establishment of the first cross-Council data support service. The concerns of the Research Councils to ensure that 'their' research community received a fair share of the pooled resources reinforced the operational rule that every project should be required to comprise a social and natural science dimension. Paradoxically, through this thoroughgoing insistence on interdisciplinarity at the project level, the Research Councils were able to reassert their interests in the management of the programme.

The third objective of RELU, relating to knowledge transfer, is an equally prominent dimension of the programme. The inclusion of this objective can be attributed to general criticism of past research initiatives for their lack of impact or late engagement of user communities in the research process. It was also a reflection of the origins of RELU as a strategic research investment and within a prevailing climate of science policy in which knowledge transfer was considered central to enabling the contribution of science to economic growth, innovation and social well-being (Department of Trade and Industry, 1998, 2000; Department for Environment, Food and Rural Affairs, 2003; HM Treasury Department for Education and Skills and Department of Trade and Industry, 2004).

3.3. *Design of programme specification*

The first research specification of RELU was drafted under the auspices of the SAC, informed initially by a social science adviser appointed by the ESRC and latterly by a sub-group of the SAC (comprising a senior social scientist, biologist and environmental scientist). Four broad research themes were identified: (A) integration of land and water use; (B) environmental basis of rural development; (C) sustainable food chains; and (D) economic and social interactions with the rural environment (Table 2). These themes have subsequently structured the direction of the programme. They were subject to a web-based consultation and discussions with key public sector agencies in the rural field followed by regional events throughout the UK involving mainly the science community. The programme specification included lists of indicative research topics, but remained open in terms of methods, epistemologies, approaches to interdisciplinarity, disciplinary collaborations and the research problems to be addressed (within the identified themes).

A contentious matter was whether the rule that all projects must combine natural and social science could be relaxed to allow the programme to fund exclusively social research agendas on rural economies, such as rural service provision, social exclusion, small business development and governance. The consensus that emerged was that such mainstream issues of rural social science were not appropriate for this inter-Research Council initiative which should concentrate on

Table 2

Rural Economy and Land Use (RELU) programme research themes

(A) The integration of land and water use

The management and determination of rural land use have shown insufficient attention to the effects on water resources, leading to unacceptable pressures on those resources, both quantitatively and qualitatively, and on requirements for remedial management. Specific problems include over abstraction and low flows, flooding, erosion, siltation, diffuse agricultural pollution, eutrophication and loss of biodiversity. This field of major policy concern requires an integrated approach, combining natural and social science analysis, to the management of land and water resources and the minimisation of emissions from land to water and air. Such an approach is needed to meet, in particular, the challenges presented by the Water Framework Directive ..., as well as the opportunities opened up by CAP reform. Interdisciplinary research is required to understand and identify the obstacles to, and means of, achieving integrated and sustainable land and water use.

(B) The environmental basis of rural development

Local and regional government and development and conservation agencies ... are concerned with understanding and harnessing the complex contributions that rural landscapes, environments and lifestyles make to the quality of life and the competitiveness of regions. Besides food production, rural areas have crucial roles to play in forestry, the production of energy and non-food crops and in key restorative functions such as waste management. The ecological and economic feasibility and social acceptability of these roles need to be understood. In addition, the operation of incentives and controls at the local and farm levels is required to achieve sustainable patterns of rural land use, management and development at the regional level that not only protect and enhance biodiversity, soils and the character of the countryside but also make the most of these assets for wider social and economic benefit. Interdisciplinary research is required to understand how to achieve a sound environmental foundation for rural conservation and regeneration, and to clarify its potential contributions to wider regional prosperity and wellbeing and to the government's sustainable development objectives.

(C) Successful and sustainable food products and food chains

Advances in basic and strategic research have greatly expanded the potential to produce healthy food in an efficient, humane and environmentally sustainable manner, but social and economic factors will influence the uptake and value of this research, as well as its future direction. High-profile controversies, including animal disease outbreaks, food contamination and GM crops have affected public confidence in food and raise questions about the nature of supply chains and relations between producers, processors, retailers and consumers. Changes in global trade relations, the CAP and growing awareness of the environmental and social costs associated with where our food comes from and how it is produced will influence markets for British producers. There is an urgent need to understand costs and benefits, their scientific basis and how they will influence food prices and the sustainability of the food industry. Solutions to new pest and disease outbreaks, the over-use of chemical inputs in food production and microbial contamination of food require an integrated, interdisciplinary approach involving social, economic and natural science. Research also needs to take an integrated, food chain approach, which considers producers, processors, retailers and consumers. Research should explore the feasibility of shortened food chains, speciality and regional food production, and ensure traceability of food throughout the food chain, and the sustainable recycling of waste products.

Table 2
(Continued)

(D) *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 and possible land abandonment, other areas face continuing development pressures and potentially competing demands on the countryside – for housing and employment, for space and facilities for leisure, sport and relaxation, and for extensive land uses – all with significant implications for rural economies and the rural environment. Interdisciplinary research is required to analyse these changing social and economic functions of the countryside, to understand what shapes them, to assess their environmental consequences and to identify means of managing them sustainably.

Note: The extracts are taken from research specifications published for RELU's first and second call for research proposals in 2003 and 2004.

opening up new research agendas at the interface between social and natural sciences. The consequence was to focus the programme on land-based aspects of rural economies (where the environmental and biological sciences could also make a contribution). This decision was a source of disappointment to some rural interests and academics.

The competition for funding under the programme was divided into three successive annual calls for research proposals announced between 2003 and 2005. The first call funded large-scale research projects (up to £1 million) addressing theme C of the programme (see Shepherd *et al.*, 2006; Tiffin *et al.*, 2006; both in this issue). The first call also experimented with various modes of support for preparatory and developmental initiatives (across all of its research themes). These provided more modest funding (£20,000–50,000) specifically to build up linkages between researchers from different disciplinary backgrounds and with stakeholders, while scoping novel research topics and methods (see Dougill *et al.*, 2006; Huby *et al.*, 2006; Marzano *et al.*, 2006; Matthews and Selman, 2006; Waterton *et al.*, 2006; all in this issue).⁶

After the appointment of the Programme Director, a communication plan was drawn up which envisaged knowledge transfer as 'a continuous and iterative process, in which stakeholders are engaged as active partners in establishing the priorities and foci of the programme, and not treated merely as the passive recipients of the results of the research when completed' (RELU, 2005, p. 1). A range of communication mechanisms were promoted at programme and project level, including: stakeholder forums – embracing a broad constituency of key national organisations from the public, private and voluntary sectors – to act as sounding boards on programme and project development; the negotiation of bespoke Stakeholder

⁶ These experimental modes of funding included: Capacity Building Awards up to a maximum of £50,000 to facilitate the development of interdisciplinary research capacity through, for example, support for interdisciplinary events involving social and natural scientists; Scoping Studies, involving awards up to £50,000 which aimed to scope interdisciplinary research agendas; and Development Activity Awards of up to £20,000 for activities designed to facilitate the overall development of the RELU programme and/or demonstrate its value and potential.

Engagement Plans (SEPs) to involve core stakeholders across the programme; the requirement for project level communication plans; and the involvement of user groups in project assessment and selection. The programme thus set out to embrace a pluralistic and inclusive stakeholder community for research on rural economies, looking to depart from a narrow agricultural corporatism that had been a feature of previous user engagement in agenda setting for rural research (see Table 3).

In 2004, in the lead up to RELU's second and largest call for research proposals (which was for large research projects addressing RELU themes A, B and D), the programme's research specification was subject to a web-based consultation, together with invited stakeholder group submissions and bilateral consultations with key stakeholders. Following the consultation, the detailed specification of the programme was revised including elaboration of the programme's objectives, research challenges and interdisciplinary rationale. A similar exercise was undertaken in 2005 in preparation for RELU's third and final call.

3.4. Proposal selection

In response to the funding calls, groups of scientists prepared proposals to the programme. Selection of projects involved a two-stage process of full disciplinary peer review (appropriate referees were selected according to a proposal's particular social/natural science mix), followed by an assessment panel which judged the interdisciplinary construction and justification for the project. The assessment panel was charged with making the final judgement about the overall scientific quality and strategic value of the projects that should be funded. Judging the scientific quality of proposals proved to be by no means straightforward and the process highlighted the inherent difficulties in assessing interdisciplinary proposals in a primarily disciplinary world.

The referees were drawn from all three Research Council communities. Many were unfamiliar with the ESRC's distinct grading system (which was the one adopted by the programme) and most referees only felt comfortable judging those aspects of proposals with which they were familiar (e.g., the biology or the ecology or the economics). Nevertheless, with a mix of natural and social scientists as referees for each project, the process sought to ensure that the disciplinary components of research projects were rigorously assessed.

Assessing the quality of a project's interdisciplinarity was a more demanding but critical requirement. Specific guidance was developed for referees and assessors who were asked to recognise that interdisciplinary research should be viewed positively rather than as a threat. It was highlighted that such research may be riskier in many respects and this demanded the peer review process be open to new ideas and approaches. It was also posited that the natural or social science elements of a proposal may not necessarily have to be wholly innovative within a specific disciplinary context, but that when taken collectively they could result in innovative research (i.e., the sum could be greater than the parts). A breadth of understanding was required of assessors when a main source of the quality of proposals lay in their interdisciplinarity. In judging proposals, the attention of assessors was drawn to: the conceptual and theoretical foundations and hypotheses; the integration of natural and social science perspectives; the methodology to facilitate working across disciplinary boundaries; the specification and justification of the interdisciplinary approach; the reasoning for the choice of disciplines; as well the plans for engaging users and stakeholders in the research.

Table 3
Examples of formal stakeholder engagement at the programme level

Stakeholder	Representation on programme management or Strategic Advisory Committee	Representation on national stakeholder forum	Representation on assessment panel*	Targeted consultee in shaping call for proposals†
Action with Communities in Rural England		✓		✓
Advantage West Midlands Regional Development Agency		✓		
Agri-food Partnership		✓		
Association of National Park Authorities		✓		
Association of Rivers Trusts		✓		
BBC				
British Potato Council		✓		✓
Clinton Devon Estates				✓
Country Land and Business Association		✓	✓	✓
Countryside Agency	✓	✓		✓
Countryside Council for Wales	✓	✓	§	✓
Department for Environment, Food and Rural Affairs‡		✓	§	✓
English Nature	✓	✓	§	✓
Environment Agency‡		✓		✓
Food Ethics Council		✓		✓
Food from Britain		✓		
Food Standards Agency		✓	§	
Forestry Commission				✓
Henley Centre (marketing consultancy)		✓		
Home Grown Cereals Authority		✓		✓
Ian Brown (diversified tenant farmer)		✓		
Institute for European Environmental Policy		✓		
International Institute for Environment & Development		✓		
Joint Nature Conservation Committee	✓		✓	✓
Land Use Policy Group				✓
Leckford Estate			✓	

Table 3
(Continued)

Stakeholder	Representation on programme management or Strategic Advisory Committee	Representation on national stakeholder forum	Representation on assessment panel*	Targeted consultee in shaping call for proposals†
Marks and Spencer		✓		✓
National Farmers Union		✓		✓
National Trust		✓		
One North East Regional Development Agency		✓		
P.C. Tinsley Ltd (cereal/vegetable farmer)		✓		
Pembrokeshire Fish Farms		✓		✓
Royal Agricultural Society for England		✓		
Royal Institution of Chartered Surveyors		✓		
Royal Society for the Protection of Birds		✓	✓	✓
Scottish Environment Protection Agency	✓		✓	✓
Scottish Executive, Environment and Rural Affairs Department‡	✓		§	✓
Scottish Natural Heritage				✓
Scottish Water				
Soil Association		✓		
Sustainable Development Commission				✓
UK Water Industry Research‡		✓		✓
Unilever		✓		
Welsh Assembly Government‡		✓		✓
Wessex Water Company		✓		
Youth Hostel Association		✓		

Notes:

*As observer or assessor. Many stakeholders were also engaged in refereeing research applications.

†Open consultations also took place, including 'warm-up' events around the first call for proposals and web consultations for all three funding calls. For the third call, a mailbox of 1600 members was consulted.

‡Stakeholder Engagement Plan established.

§Attendance as observer.

Members of the assessment panel included senior academics from the three science communities and a selection of key stakeholders. Handling the inherent (mostly creative) tensions within the assessment process – associated with the reframing of research problems, the unsettling of established resource balances and the expression of extra-disciplinary judgements – was by no means straightforward. Inevitably, RELU assessment panels had to grapple with incipient tendencies towards partisanship amongst assessors (i.e., being preoccupied with the interests of ‘their’ own research community). A difficulty the panels found was in maintaining a clear division of labour between their role and that of peer review.

3.5. *The projects*

In all, 34 small awards (with one in three proposals funded) and 19 large research projects (a one in six success rate) were selected for funding under RELU’s first and second calls for proposals. They involve over 30 disciplines, the most prominent being economics, ecology, human geography, physical geography, environmental chemistry and hydrology (Figure 1). There are also some unusual disciplinary collaborations, for example, philosophy and soil science, and crop science and development studies.⁷ Projects span all four of the programme’s thematic areas. A number are examining frameworks for sustainable catchment management and integrated land and water use (see Waterton *et al.*, 2006, this issue). Particular attention is being given to the integrated modelling of impacts of CAP reform and the Water Framework Directive upon rural land use, biodiversity and farm incomes, and to understanding the causes, consequences and management of diffuse pollution and flooding (see Bateman *et al.*, 2006; Lane *et al.*, 2006; both in this issue).

Other projects are considering themes concerned with achieving a sound environmental foundation for rural conservation and regeneration, such as integrated systems for assessing agricultural and rural sustainability (Huby *et al.*, 2006, this issue); the effects of scale and concentration of alternative farming systems in determining impacts on the environment and farm businesses; and the social, economic and environmental implications of increasing land use under energy crops.

Under the broad heading of sustainable food chains, RELU researchers are adopting an integrated, food chain approach to explore several research themes including: the environmental, community and nutritional impacts of consuming vegetables produced locally and overseas; the links between quality food production and biodiversity protection; the opportunities for the sustainable recycling of livestock waste to land; the implications of a nutrition-driven food policy for rural land use (see Tiffin *et al.*, 2006, this issue); the development of tools for assessing and managing food chain risks (see Shepherd *et al.*, 2006, this issue); and the realisation of biological alternatives to chemical pesticide inputs in food production.

⁷ RELU’s third call focused on sustainable rural and regional development and the management of animal and plant diseases. These were chosen as important substantive gaps but also lacunae in interdisciplinary coverage. The first theme draws the engineering sciences into research collaborations within the programme, the second addresses the traditionally weak relationship between the social and bioscience communities.

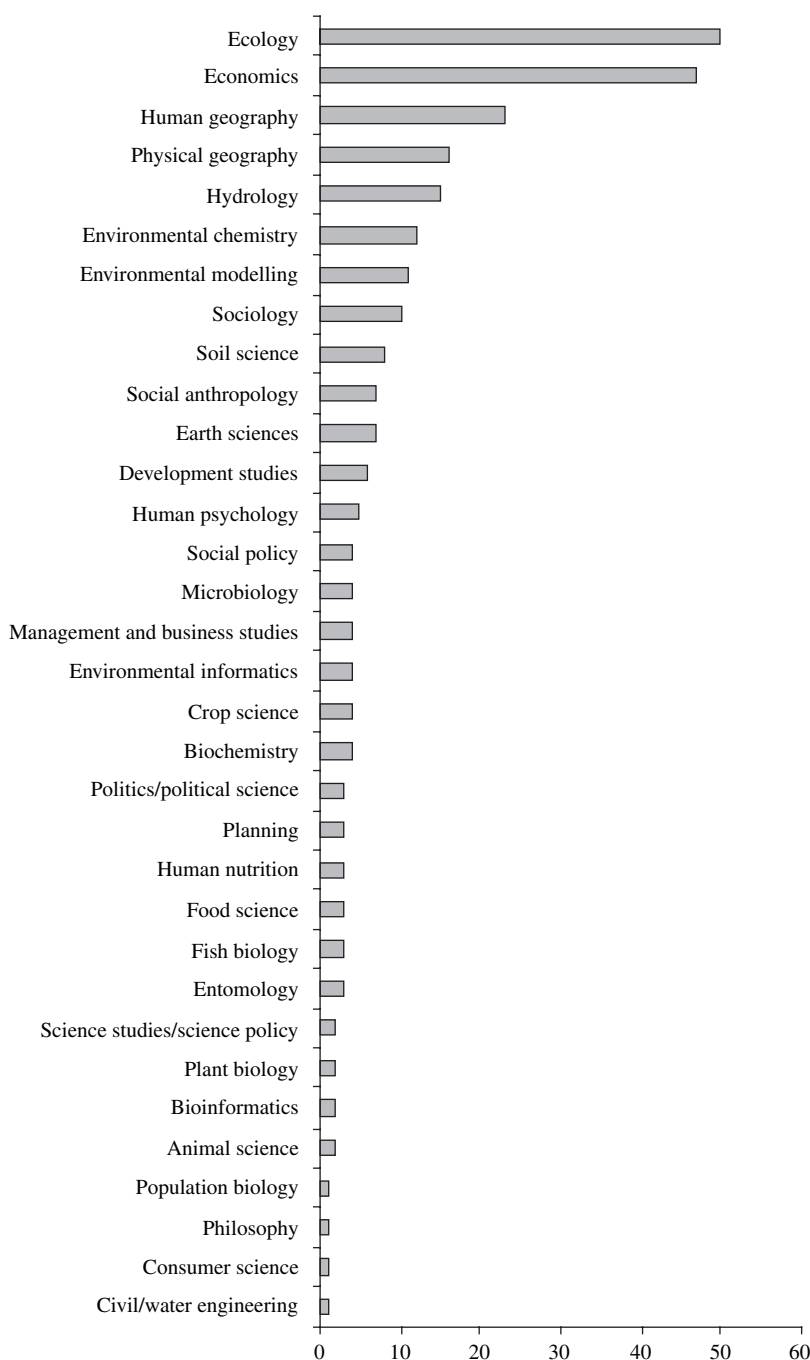


Figure 1. Number of research investigators by discipline (first and second rounds).

Finally, research is exploring the changing social and economic functions of the countryside to understand what shapes these roles, their environmental consequences and the means of managing them sustainably. One focus, for example, is on the public formulation of social, economic and environmental scenarios for

upland areas and the development and testing of appropriate frameworks to allow local people to monitor and evaluate the direction of change (see Dougill *et al.*, 2006, this issue). Another avenue of research is exploring the role of landscapes as a unit of analysis and a normative concept in understanding and promoting sustainable rural development (see Matthews and Selman, 2006, this issue).

Individual projects are developing their own approaches to interdisciplinary working including, *inter alia*: providing integrated assessments of technologies and systems; designing diagnostic measures of system performance; offering synoptic perspectives on geographical areas and the holistic analysis of problems; combining research techniques and methods; developing approaches to the modelling and monitoring of systems; combining social and natural science datasets; developing tools, techniques and methodologies to support decision-making; and facilitating interdisciplinary dialogue and the scrutiny of key concepts. The different approaches are illustrated in the contributions to this Special Issue.

The most extensive and tailored stakeholder engagement activities within the programme are taking place at project level. The researchers are applying and experimenting with a range of collaborative research techniques and approaches and engaging with various organised interests, end-users and the broader public through diverse models of engagement, some in an advisory capacity, others as consultees, informants or research partners (Phillipson *et al.*, forthcoming). In this way, the projects are enlarging the 'public' constituency for research in this field. Many are beginning to break down the traditional boundaries between knowledge producers and knowledge users, recognising the contribution to knowledge production of multiple forms of expertise – among academics, policy-makers, practitioners and broader 'publics'.

4. Concluding Remarks

In this paper, we have reflected on the rationale of the RELU programme and considered how in its inception it has tried to respond to broader reciprocal demands for interdisciplinary research and greater research accountability. Ultimately, the value of the programme will be demonstrated in the execution of its projects and in the legacy of scientific capacity that they leave behind. At this stage, however, we think it is useful to explore the decisions and processes that have shaped the programme and their receptiveness to non-academic influences and priorities.

The programme emphasises how making decisions on research agendas and funding more transparent and accountable is by no means a straightforward task. The paper has cast light on the challenges that accountability presents to the configuration and routines of science institutions and their decision-making structures. Different stages in the establishment and elaboration of the RELU programme were to varying degrees open or closed to external scrutiny and the involvement of stakeholders and user groups. Thus, framing of the broad orientation of the programme on rural economy and land use, as well as overall programme selection, was characterised by an elite and closed process of decision-making involving senior staff of the Research Councils, the Treasury and the government. The commitment of the programme to interdisciplinarity and stakeholder engagement also arose from relatively closed decisions among senior Research Council staff. The identification of research themes within the programme was then subject to consultation largely with the scientific community. It was not until the stage of further elaborating the

research specification for the programme that widespread consultation took place with a range of stakeholders. Extensive engagement of a wide range of stakeholders was also a major feature of project design and execution. In conclusion, there is a significant element of rhetoric in the programme's commitment to stakeholder engagement throughout. It is clear from the analysis that the framing of research problems was most open and accountable to external influence at the following two stages: elaboration of the research specification, and project design and execution. At the other stages, governmental and scientific elites were the dominant influence, with decision-making largely closed.

In contrast, interdisciplinarity and integrated working have been more methodically pursued at all the various levels in the programme's organisation. Again, this is arguably most thoroughly and systematically the case at the project level. Indeed, the array of RELU projects together represent a unique experiment in interdisciplinarity, whose value will be demonstrated by what they achieve. But interdisciplinarity has also been actively sought at inter-Research Council and programme management levels through various institutional innovations. Perhaps, the greatest difficulties here have been experienced in the project assessment process, by no means because of the lack of effort, but given the challenge of undertaking interdisciplinary assessment in a disciplinary world.

There may be wider lessons to be learnt from the experience of the RELU programme. Research Councils UK, the umbrella body for the UK Research Councils, has itself acknowledged that interdisciplinary research requires 'changes in institutional structures, in funding and training mechanisms, and most importantly to the cultural environment in which research is carried out' (Research Councils UK, 2004, p. 2). In turn, the achievement of the RELU programme's ambition to encourage long-term interdisciplinary research capacity may depend upon such wider institutional reform.

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