

**RNRRS SYNTHESIS STUDY N° 10**

**INNOVATIONS SYSTEMS: CONCEPTS, APPROACHES AND  
LESSONS FROM RNRRS**

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## EXECUTIVE SUMMARY

This study on “innovation systems” is one of a group of cross sectoral synthesis studies that examine a set of common issues within the ten research programmes of the RNRRS with a view to distil the experiences and lessons learned. The RNRRS programme has been operating from 1995 to 2005, with ten individually contracted research programmes, and over 1600 research projects. The RNRRS framework has been characterised by significant changes and evolution over its life. This was largely driven by DFID, as the donor, which initially stressed “research” and “scientific publications” but increasingly laid greater emphasis on the poverty impact of research on poverty. DFID did not use the language of innovations earlier (although they were implicit) but have been made more explicit recently.

This synthesis report shows that many of the elements that make up the ‘innovation systems (IS) approach’ have been increasingly incorporated within the different RNRRS programmes as they evolved. A number of key elements, such as capacity development, communications, participatory and action research became standard practice (and are being analysed in the other synthesis studies that have been undertaken in parallel with this one). But this report suggests that the developments of these elements have been largely unsystematic across the programmes while individual programmes developed and incorporated many elements on their own with some taking a more deliberate and formal approach.

The document discusses the principal elements of the innovation systems (IS) approach and the methods used for this study. It cautions that without indicators of impact it is particularly difficult to demonstrate that one approach to research fund management has more impact than another. It points to impacts that they are often diffuse, cumulative over long periods of time, and difficult to attribute to particular research inputs. This quick synthesis of a vast range of materials and activities meant that much has to be inferred and the conclusions are largely qualitative.

The report discusses the evolution of different programmes, at differing speeds, to differing degrees and with differing effectiveness along a number of common dimensions suggested by the IS approach. Then the report discusses special features that were exhibited by some of the programmes and states that these differences arose from their different history, their internal capacities (e.g. social and other science perspectives), and the nature of the problems they were addressing. There appears to have been little systematic ‘institutional learning’ between the various RNRR programmes. Much of that appears to have been due to the inability of DFID to manage several functions.

Finally, the report draws some lessons for the future. The main lessons are (a) the IS framework provides a useful framework to guide research managers wishing to achieve innovation. (b) an initial “system diagnosis” in particular are crucial and can be simple or complex (depending on the resources available). (c) innovation projects can have impacts in reducing poverty but if they are also to provide it is necessary to invest explicitly in this learning process to extract the higher level generalisation both about the process (programme management and innovation) and the content of the innovation process.

### The Study Objectives:

This study on “innovation systems” is one of a group of cross sectoral synthesis studies that examine a set of common issues within the ten research programmes of the RNRRS with a view to distil the experiences and lessons learned. This and the other studies address key lessons, general thematic development messages, evidence based lessons learned, and the challenges ahead. In summary, the objective is to:

- Provide an overview of some eleven years’ experience, drawing out common and contrasting lessons.
- Provide a framework for the future incorporation of innovations systems issues into research activities, with some principles and criteria that would be of use to both DFID’s Central Research Department (CRD) in framing new calls for research, and to prospective research programme and project managers in responding to these calls.

(Annex 1 provides the exact terms of reference)

## BACKGROUND

The RNRRS has been operating from 1995 to 2005, with ten (originally eleven) individually contracted research programmes, which have collectively supported over 1600 research projects. There is already a vast amount of information available with regards to the RNRRS. The RNRRS framework has been characterised by significant changes and evolution of the programs over the period. This has been first driven by changing priorities in DFID, as the donor, which stressed “research” and “scientific publications” initially but following the White Paper in 1997<sup>1</sup>, laid greater emphasis on the poverty impact of research. This resulted in a 1998 review of the RNRRS programme that emphasized the importance of generating benefits for the poor. This was further reinforced in the 2000 White Paper with a shift from a focus on outputs to outcomes and longer term impacts<sup>2</sup>. In 2002 there was yet another review of the programmes<sup>3</sup> and an effort to develop a set of benchmarking and impact assessment tools.<sup>4</sup>

All the research programmes can be said to have shifted to increase the emphasis on pro-poor research, providing evidence that the research outputs supported poverty reduction. They also emphasised, to differing degrees and with differing emphasis, the importance of a range of

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<sup>1</sup> “Eliminating World Poverty: A Challenge for the 21<sup>st</sup> Century”. 1997. White Paper on International Development, Presented to Parliament by the Secretary of State for International Development, by Command of Her Majesty November 1997, Cm 3789.

<sup>2</sup> Eliminating World Poverty: Making Globalisation Work for the Poor, White Paper on International Development, Presented to Parliament by the Secretary of State for International Development, by Command of Her Majesty December 2000, Cm 5006. [www.globalisation.gov.uk](http://www.globalisation.gov.uk).

<sup>3</sup> Flint and Underwood, 2002, Synthesis Study of the Impact of Renewable Natural Resources Programme, October 2002.

<sup>4</sup> Undertaken by the Performance Assessment Resource Centre (PARC). DFID.

partnerships, capacity building, dissemination and uptake as necessary preconditions for successful impact on poverty.

The external forces that have brought about these changes are well known and documented. In addition to the White Papers, they also include the process by which DFID divested itself of its own dedicated ‘tropical’ research institutes and the introduction of a competitive tendering model, which reached its conclusion with the ‘untying’ of DFID research grants from UK institutions. These forces resulted in an increasingly larger percentage of funds spent in developing countries, by local partners, allowing greater local partnership as well local leadership in strategy, direction and execution.

But as the LTS evaluation states, perhaps the largest change concerns DFID’s own role in the innovation process. An early premise of the RNRRS programme was that DFID would be the main client for DFID financed research and would be the principal implementer at scale of the outputs of these research programmes. This premise did not hold true for the duration of the programme as DFID shifted its structure and ways of doing business. It was neither able to nor willing to fulfil this role. Nor did DFID come to believe that it had any responsibility to do so<sup>5</sup>.

All Programmes and their Managers therefore had to adapt both their project portfolios and individual projects to meet the new demands from DFID<sup>6</sup> as well as the new opportunities. The changes have included a greater share in social science research, thereby reducing the natural science components; increasingly integrated and greater multidisciplinary research; a move from more basic research towards the applied end; greater and systematic attention to policy; a cluster approach; and a focus on the livelihoods of poor people. The RNRRS evaluation states that from an early beginning with a traditional research focus, all programmes have evolved over the period but not necessarily with thematic continuity and synergy.

Although DFID did not use the specific language of innovations in the 1997 or 2000 White Papers they did contain many of the ideas. But these terms have been made more explicit in DFID’s recent research strategy documents and consultations<sup>7</sup>. This approach is probably now the dominant paradigm in research funding for most OECD countries and has recently been adopted by the NEPAD Ministers of Science and technology. DFID is currently considering whether to widen the scope of its programmes to increase the impact on poverty reduction of its research investment by explicitly focussing on “innovation” and the lessons from the wealth of experience around the world about how

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<sup>5</sup> In terms of the IS framework this is a major change in the framework conditions of the innovation system. The role of international institutions, such as DFID, in the national innovations systems of developing countries is discussed in Rath (1991). The same issue also has the seminal paper by Biggs on Innovation Models in Agricultural Research.

<sup>6</sup> This has been described as changing goal posts during the game. We would add that the changes not only involved the goal posts but the rules of the game changed considerably over the decade, with for instance training for capacity development prohibited initially and then gradually accepted and then encouraged. Some programmes were not always equally aware of the change in the rules as they proceeded.

<sup>7</sup> For instance see Martin Surr, (team leader), Andrew Barnett, Alex Duncan, Melanie Speight, with David Bradley, Alan Rew, John Toye, Research Policy Paper. DFID, November 2002. [http://www.DFID.gov.uk/Pubs/files/pov\\_red\\_pol\\_paper.pdf](http://www.DFID.gov.uk/Pubs/files/pov_red_pol_paper.pdf). And DFID’s Response to Electronic Consultation on the proposed Strategy for Research on Sustainable Agriculture, 2005, <http://www.dfid.gov.uk/research/srsa-response-final.pdf>.

innovation is best achieved<sup>8</sup>.

There is a great deal of literature on the relationship between research and innovation, particularly in OECD countries. This literature is summarised in Annex 3 and contrasts two opposing models - the “linear model” in which research is completed and then “disseminated” to end users through some form of extension services; and the “Innovations Systems (IS)” model<sup>9</sup> in which users of knowledge and suppliers of knowledge interact from the outset of the research to ensure that innovation takes place. The two contrasting models are really simplified mental constructs of a highly complex phenomenon and neither truly describes practice in any pure form.

As is to be expected for an approach that tries to build on existing best practice in research management, this synthesis report shows that many of the elements that make up the ‘innovation systems approach’ have been increasingly incorporated within the different RNRRS programmes as the emphasis on ‘poverty impact’ has strengthened in recent years. A number of these key components, such as capacity development, communications, participatory and action research are being analysed in the other synthesis studies that have been undertaken in parallel with this one. But this report suggests that the development of these elements has been largely unsystematic in the sense that there was little learning across programmes for RNRRS as a whole (individual programmes found a number of different entry points and followed elements of an IS approach with the Crop Post Harvest Programme (CPHP) taking the most formal recognition of these elements). This is not surprising given that while the changes have represented major shifts of direction for the programmes there have been no syntheses during the programme lifetime of lessons learned from these shifts. This has resulted in highly uneven and unsystematic cross fertilization of experiences between the programmes and is clearly a major shortcoming that should be more deliberately addressed and provided for in any new calls in the future (this is discussed further).

The purpose of the current cross programme synthesis studies, including this one focused on “innovation systems” is to take a first cut at distilling these experiences, and the lessons learned together with common issues across programmes together with the positive and less positive aspects of the evolution in the program portfolio<sup>10</sup>. It is argued here that the IS framework provides valuable insights as why innovation does and does not occur, and indicates those actions that managers of research programmes can take that are most likely to be effective in bringing new ideas, and technologies into use – that is, to achieve innovation.

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<sup>8</sup> See for instance “For agricultural research to have real impact strong linkages into innovation that lifts people out of poverty are crucial. These linkages include demand appraisal and problem identification, participatory research, site-specific validation of outputs and effective promotion of outputs”. (paragraph 11, Consultation on DFID research funding framework: Synthesis of Comments and DFID response by the Central Research Department, 7th September 2004).

<sup>9</sup> Also sometimes called a “knowledge systems” approach. They both follow from OECD and other research on National Systems of Innovation. See Annex 3, or more generally Erik Arnold and Martin Bell *Some New Ideas About Research for Development*, in Danish Ministry of Foreign Affairs: Partnership at the Leading Edge: A Danish Vision for Knowledge, Research and Development (April 2001). Page 288. Down load from:  
[http://www.um.dk/NR/rdonlyres/7CD8C2BC-9E5B-4920-929C-D7AA978FEEB7/0/CMI\\_New\\_Ideas\\_R\\_for\\_D.pdf](http://www.um.dk/NR/rdonlyres/7CD8C2BC-9E5B-4920-929C-D7AA978FEEB7/0/CMI_New_Ideas_R_for_D.pdf)

<sup>10</sup> This effort to synthesise information across programmes is relatively small in the time and resources available can be easily inundated by the enormous quantities of project and programme reports. To avoid that we requested the Programme Managers to provide only selected samples of documents that will best illustrate the way and the extent to which the innovations systems approach has been used in selected cases and which allow key lessons to be drawn.

## METHOD

The report describes what constitutes the key elements of the “innovation systems” (IS) approach: in essence this is a summary of what has been shown to work in achieving innovation and an attempt to extract lessons for ‘best practice’ from a very large range of both literature and experience. The synthesis attempted to determine the extent to which the elements of innovation best practice were incorporated into each programme. In order to achieve this objective a number of steps were taken. First an initial briefing document on innovation systems and a questionnaire (both are provided in Annex 3) were sent to each program manager. They were asked to review the brief, then to score their own programme on the extent to which they use of a set of processes that are key elements in an “innovation systems” approach and to provide up to three examples of project related documents that illustrate their use of the innovation systems approach, together with any additional comments. The material submitted was then reviewed together with material from the programme web sites, Annual Reports, evaluations, and selected project documents. Additional information was provided by the recent LTS evaluation of the RNRRS programme<sup>11</sup>. Lists of documents reviewed and the people interviewed are provided in Annex 2<sup>12</sup>. As this review could have potentially covered a very large number of documents and issues, we have had to be highly selective in such a short presentation as this.

This documentary material provided a basis for structured and informal conversations with the programme managers and their teams, and these discussions provided the largest input to this review. During these discussions the key informants were encouraged to reflect, not just on the lessons of the past, but also on ways in which innovation issues might be integrated into future research programming.

One of the authors has been involved in a more in depth study of the innovation approach in the Crop Post Harvest Programme (CPHP) and it was therefore requested that the findings of this larger study be incorporated into this synthesis<sup>13</sup>.

A key feature of work in this area is the difficulty of measuring and attributing impact. Indicators of impact and uptake of the DFID investment in research are scanty. This is a major finding confirmed by a number of studies, including the LTS evaluation mentioned above<sup>14</sup>. Without this evidence of impact, it is particularly difficult to demonstrate that one approach has more impact than another. This is not to say that there are no impacts, but that they are often diffuse, cumulative over long periods of time, and difficult to attribute to particular research inputs. This means that in this quick synthesis of a vast range of materials and activities much has therefore to be inferred or interpolated.

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<sup>11</sup> This provides over 500 pages of evidence and information on the programmes, with detailed specialist comments on each programme and formed an important source document for this synthesis.

<sup>12</sup> Annex 2 does not list the total of 37 projects that were submitted for the programmes, with over 50 documents and a number of annual reports and web sites that were reviewed.

<sup>13</sup> *Journeying from Research to Innovation: Lessons from the DFID Crop Post Harvest Research Programme's "Partnerships for Innovation"*, FINAL REPORT, January 2006 by Andrew Barnett, CPHP.

<sup>14</sup> The lack of evidence on impact does not mean either a lack of impact – as we believe there have been many, or a lack of effort by programmes at determining impact – the LTS study lists a total of 35 studies supported by the programmes.



Only one set of data was requested from the programme managers and this focused on the perception of the Managers regarding their use and/or presence of various characteristics/features in the programmes that represent elements of the innovation systems (IS) approach. There are several caveats to the data. First, it is in all cases a subjective judgement of 10 years of work. Second, there are definitional problems, and different interpretations by each programme; for example the programme self scores to the first question ranged from 3 to 5 but in the discussions with the responsible programme managers it was clear that the difference did not mean much. The low scoring manager believed that over the earlier years they could have used more of an innovations framework and a high scoring programme reported on what they believed they had achieved by the end of the programme. The numerical scores have therefore been only used to support some of the qualitative statements and observations that programmes found it easier to incorporate the earlier elements and had more difficulty with the later elements. (The mean numerical scores have been provided in Annex 3 and should not be interpreted as providing absolute numerical values.)

We acknowledge and are very grateful to all the Programme Managers for responding to our questions with short and long notes, for filling out the questionnaire, for taking the time for the very valuable and frank discussions with us, and their feedback to the first draft<sup>15</sup>. This was especially commendable as they had other highly pressing demands on their time as well as the competing demands from the other synthesis studies.

## KEY AND COMMON FEATURES

All ten programmes started out with their interpretation of the RNRRS Strategy Document (known as the “Yellow Brick”) prepared by DFID in 1994 that set out the agenda for the 1995 – 2005 period<sup>16</sup>. The goals set out in 1995 were the alleviation of poverty, the promotion of economic growth and of economic reform, and the mitigation of environmental problems, through research that removed constraints on natural resource development, was wealth creating and/or improving the life for beneficiaries in developing countries<sup>17</sup>. It also asked that the research projects be ‘demand-led’, responding to the clearly defined problems of specified groups among which one important client was DFID itself.

Another key factor that differentiated the programmes at the start was the different histories of each programme area before the new format of the RNRRS 1995-2005<sup>18</sup>. Many sectors such as forests, crops, animal production and health, and, others have been funded for decades by the UK government under different development budgets and institutional arrangements. For many of these programmes the new DFID arrangements were already a major dilution of resources and a shift towards a more applied nature.

Essentially these shifts in direction and emphasis led to parallel shifts in each of the programmes, away from what we label as a more “linear” model of research inputs leading to applications<sup>19</sup> to a slowly evolving, new

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<sup>15</sup> We circulated a first draft, with the overall framework, the initial findings, and the directions of this report to the key informants to obtain their feedback.

<sup>16</sup> ODA, 1994, Renewable Natural Resources Strategy 1995 – 2005, Final Report, Research Task Group. May 1994.

<sup>17</sup> LTS, page 1.

<sup>18</sup> This type of “path dependence” has a significant place in the innovation literature. At its simplest it means that “what a company or institution can do today depends on what it could do yesterday, and what it has learnt in the meantime”

<sup>19</sup> It needs to be noted here that very few managers agreed that they followed the “linear model” of research. But there was a general agreement that in the initial period the approach was more traditional and the work was seen

and wider set of activities, that went considerably beyond the earlier set of work supported. In the discussions with the programme managers and the analysis of the completed questionnaires we discern three distinct phases – the first lasting until 1998 that can be called “business as usual”, then a continuous period of search and change, from 1999 to 2002 to adapt the programmes to incorporate features that would support the new demands on achieving outcomes and impacts, and then the final three years that have been a combination of implementation of the new strategies by the programmes and also simultaneously winding down the programmes for their conclusion by March 2005, now extended to March 2006<sup>20</sup>.

The first change that was often taken by all programmes (at differing speeds) was to strengthen the linkages with the potential users of the knowledge generated, for instance “dissemination of knowledge in the South was a key element of the Animal Health Programme (AHP) from 1998” (LTS page 266); “focused on different aspects of knowledge dissemination to end users”, studies were supported (R7359 and R7360) that examined the barriers to dissemination of effective disease control methods, leading to new media and formats being used. The Post Harvest Fisheries Research Programme (PHFRP) shifted in 2000 to consider “dissemination” too passive an approach and took up the “promotion” of solutions. Similarly, the Forest Research Programme (FRP) defines all its work as having shifted in 1999 with the biggest changes in dissemination being a strong and new focus on new users of the knowledge, going beyond the scientific, to audiences such as national and international policy makers and also the poor communities. The Crop Protection Programme (CPP) designed a new web site in 2003 that was more user friendly. It distinguished its audience as belonging to different types such as farmers, researchers, NGOs, extension services and the private sector with each having different requirements.

As RNRRS programmes evolved greater emphasis was given to emphasising the “dissemination” of the outputs of their earlier “scientific research”. This period saw the creation of web sites, the creation of material customised for farmers or extension agents, and the use of other media such as radio in addition to formal publications in peer reviewed journals. Part of this process presumably led to the research managers recognising that some of what they had done in the past did not fit the needs of the diverse array of users. As the programme evolved they tended to interact in the first instance with actors that were ‘nearest’ to them in the system (see diagram on page 5): on ‘one side’ the farmers, extension agents and NGOs, and at the other the seed merchants, the suppliers of other inputs including equipment, fertilisers, traders and ultimately regulators and policy makers.

This new emphasis on reaching users of the knowledge was the first step for all programmes, which ultimately enabled them to get users more centrally involved. The process of seeking active involvement sowed the seeds for greater partnerships, coalitions, and alliances with others especially local R&D institutions and user groups. (Our indicator 1).

Of course this process that increased partnerships was re-enforced with the change of DFID policy that increasingly regarded expenditures in and by developing countries positively. This also began the search for understanding user needs more clearly first only to “promote” the solution and then slowly more continuous involvement of wider groups of “end-users” (producer, consumer or processor) to assist in the determination

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to consist of supporting the generation of new knowledge, disseminating it in scientific journals, with other actors responsible for picking this up and acting upon it, hopefully for the benefit of poor countries and poor people. For instance see LTS, page 119 commenting on the AHP states “the early research efforts were characterised by limited knowledge generation and limited risk taking”.

<sup>20</sup> Many have used the words “dissemination phase” for this final years of the program while others see this period more clearly focused on outcomes with a more active process of engagement.



of the problem and to provide iterative feedback as innovation evolves (our indicator 2). There was also an evolution in the meaning and characteristics of their “partners”. Partners were initially other researchers, and evolved to other actors in the innovation system. Similarly, the nature of “partnerships” evolved to exhibit more equality and transparency (transparency over budgets, mutual accountability and equality over the allocation of resources being touchstones of the new types of genuine partnership).

The many steps and movements by the programmes described above are supported by the self assessment of the programmes on our indicators 1 and 2 (see Annex 3). Both indicators 1 and 2 produce a mean score of 4.3 (or between 4 and 5), the highest of all 9 questions (closely followed by number 6) reflecting their clear agreement on the value of these steps and the efforts made to achieve those needs.

We find that many programmes took a number of additional steps as they evolved further towards taking a more active strategic direction to promote innovations. Some suggestions emerged from the work done by PARC in 2002 to help set up across all programmes benchmarking and impact assessment tools. Four tools were proposed – a structured impact matrix (SIM), Impact Pathways that demonstrate how clusters of projects led to the ultimate goals; a related questionnaire and a set of Impact timelines to show how projects/clusters progressed towards the programme purpose over time. Of these the SIM did not appear to serve any valuable analytical purpose but the impact timelines and the pathways helped illustrate to many programme participants the long time lags that were often present between the first conceptualisation of the problem and the time by which it was serving users, and the multiple pathways that a single innovation can take. The Impact Pathways prepared by the programmes show the many possible paths that can and will be taken between the initial specification of a problem and its final use and impact and it echoes the many different options presented by the IS framework.

The different programmes evolved (at differing speeds, to differing degrees and with differing effectiveness) to include a greater share of social science research, (there by reducing the natural science components) and from more basic toward the applied end. They also:

- Shifted to organising around beneficiary groups.
- Prioritising impact over the generation of knowledge for its own sake.
- Emphasis on participatory processes to establish demand and prioritise research needs.
- More ‘follow-on’ and clustering of projects to allow for continuity of research themes.
- More emphasis on dissemination and uptake promotion.
- Increasing ‘southernisation’, with more southern partners, more expenditure in southern countries (up to 60 to 70% of project budgets in a few programmes in recent years).
- Explicit capacity building activities
- Links with the private sector stakeholders as partners and research users.

Most programmes also undertook several different types of strategic overviews. Many used the analytically simple<sup>21</sup> tool of cluster analysis of their projects before and after their shift in emphasis. For example, the cluster analysis of work funded under the Forest Research Programme (FRP) shows major shifts away from

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<sup>21</sup> The word “simple” is not meant to disparage the tool. In fact a number of the impact analysis and problem diagnostic studies could have been “simpler”, tried to do less, used fewer categories, and they would have delivered more useful information for decision support.

certain standard research projects on different tree types into stakeholder problem surveys on community forest management; away from rain forest ecology and greater emphasis on catchment hydrology and on non timber forest products<sup>22</sup>. It is important to note that this does not mean that at some global level of judgement research on local hydrology is “better” than local ecology but clearly the latter was seen to have less potential for direct local benefits for poor people, though with important systemic knowledge outputs while the latter was seen to remove a major constraint for some locations.

Similarly, the CPP made early use of the cluster analysis tool to begin pruning a very diverse portfolio spread across many problems and geographical areas. It then moved to identify core problems and greater geographical focus, moved out of disciplinary research and encouraged interdisciplinary teams. It began a large number of studies on uptake and the barriers. These tools resulted in a new focus on Integrated Pest Management in Eastern and Southern Africa, the more direct work with farmers.

Many of the programme changes across programmes were facilitated by changes in programme management during the period 1997-2000, such as in AHP, AFGRP, CPP, and NRSP and possibly others.

### SOME DISTINCTIVE FEATURES

A key feature of the NSI literature is “Path dependence”<sup>23</sup>. In its simplest form this means that “what a company or institution can do today depends on what it could do yesterday, and what it has learnt in the meantime”<sup>24</sup> (Rosenberg). If the actor does not have the necessary tacit knowledge it must invest to acquire it, or hire people who bring it with them. In terms of the Innovation Synthesis report, this means that each programme evolved mechanisms that encouraged innovation, but they did so in rather different ways because where they started, their internal capacities (e.g. social and other science perspectives), and the nature of the problems they were addressing.

The differences in approaches and responses between the programmes within RNRRS (for instance, in the balance between basic and applied research) often reflected differences in the history of the problems selected to be solved, as well as differences in the type of research required for different problems and also the differences between the national systems (or the institutional environments) of the key stakeholders and partners. Examples of the varying conditions by programme are illustrated below. For instance FRP research focused originally on trees, worked more naturally on a longer-term time horizon than others given their longer term life cycle. The move towards demonstrating benefits in a much shorter time frame was likely to need a more radical change in framework than some of the work normally done in CPHP for instance. Second, the normal and immediate partners for FRP are the forest research institutions, which are invariably in the public sector, with long histories of ways of working and problem definition, and also often very poorly resourced and staffed in many countries. This is a much weaker and more difficult group to influence given their inherent rigidities than the partners for many other programmes. Finally, the range of partners available for FRP is often narrower as private sector partners are often absent, or considered less desirable than in other sectors. Many of the NGOs involved in the sector have a more political, legal and organisational focus than technical, and again require a complete change in approach and problem definition to bring in as partners.

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<sup>22</sup> Source “Thematic Clustering of FRP Projects” submitted by programme.

<sup>23</sup> See Barnett, Andrew, From ‘Research’ to Poverty Reducing ‘Innovation’, A Policy Brief from SRA Ltd, January 2004. Down loaded from: <http://www.cphp.uk.com/uploads/disseminations/NSIPolicyBriefbrochure23feb04.pdf>.

<sup>24</sup> See Nathan Rosenberg, **Perspectives on Technology**, Cambridge University Press, 1976.

In the case of Fisheries Management Sciences Programme (FMSP) the programme had originally focused on ocean fisheries, population, behaviour, ecology and modelled optimal capture strategies, to avoid collapse, and increase national incomes. This was directly most relevant to national governments in small island states, many of them with long historical, colonial and dependant relationships with the UK. The work was also of value to increased knowledge of global public goods. Also the earlier research had a more diffuse audience, as the boundaries of ocean fish do not easily overlap with national governments. As the programme was told to shift away from the small island states, to countries having larger numbers of poor people and also to more direct impacts on livelihoods, the programme abandoned the earlier work and shifted to inland fisheries in 2001. The geographical focus shifted to South and South East Asia. It is not possible to conclude here that the second approach was actually more valuable for the poor than the first – even though it appears to be so. There are a large number of poor fishermen relying on ocean fish species and the work being done could potentially have great value for them. An alternate decision could have been to look at similar problems though in new geographical areas, with new partners, that included poor fishermen, their organisations and appropriate NGOs. The key point being made here is that different research areas should and did change in different ways to reflect the increased emphasis on shorter term, pro-poor applications focus.

Further examples of different approaches by different programmes, based on their perceived problems, their histories, core skills and the environment in which they worked are shown by some like Crop Protection (CPP) and AHP, which have a more clearly defined problem to which national research systems are well matched and moved to turn their research into a more systems orientation; and, CPHP moved more naturally from the traditional focus on “storage structures” and food products, to understanding market access. Whereas some of the ‘systemic’ work such as the Natural Resource Systems Programme (NRSP), is more difficult to concretise.

The case of the NRSP is particularly unusual among the programmes given the very different, extremely valuable, original concept for the programme. This was the only programme that was originally housed within DFID and the idea was that this programme would undertake the cross programme studies<sup>25</sup>. NRSP undertook a number of synthesis studies to develop the core of the new knowledge on several issues considered important such as on common pool resources, adaptive capacity to climate change, integrated floodplain management, policy processes and institutions. But they appeared to be better at research in a general academic and theoretical framework rather than being applicable directly to the poor – as required in the changed directive from DFID.

The outputs were not as useful as they could have been if they had focused on the needs of the other RNRRS programmes. The uncertain management of the programme in house, was finally resolved by DFID giving up on the management and contracting the programme out and letting it be run like any other programme. This was a huge opportunity to learn lessons that was lost. This has important implications for how DFID should or should not manage its research programmes in the future.

Returning to the theme of how programmes faced with different history and environments led to different paths of change and resulting outputs, NRSP determined in 2002 under the new management that it should focus on fewer issues, attempting to look at impact pathways and uptake promotion and work at achieving policy impacts. One issue that NRSP focused on was on rain water harvesting in arid regions. It determined

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<sup>25</sup> It has been commented that the RNRRS programme had the letter K for Knowledge in its title for some years. The NRSP programme had been envisaged to add to the practical knowledge on improving impacts that could support the other 9 programmes.

that for policy change in the area the most relevant space is at the level of national institutions. It worked with local institutions, and ensured the inclusion of research outputs into curriculum at the national university, and supported stakeholder networks.

The Animal Health (AHP) and Livestock Production (LPP) programmes adopted highly complementary approaches<sup>26</sup>, which emerged for each based on their own history and perceptions of the problem. The AHP started with disease groups as the first point of analysis while the LHP adopted defined user groups as their first point of entry. The first led to zoonotic diseases of importance to human and animal health; these then led to system diagnostics of those of greatest significance and, where solutions could be found, to the possible interventions, their ordering, and into delivery and potential impacts. The potential beneficiary population groups became identified along the process. AHP took the population within specific agroclimatic zones as the base, then defined interventions that could be of the most benefit. The former did allow for a higher science input and the latter was more grounded on the people from the start. But they both funded highly innovative efforts that we expect did have positive impacts and will have more in the future. They also found several joint projects across both programmes, such as the electronic kiosks for farmers, and the Innova project in Bolivia<sup>27</sup> (also with CPP and NRSP) even with their very different starting points.

The CPHP was the only programme that chose to adopt an explicit IS approach. The details of this process, how it was done, and the lessons learned are set out in a recent report<sup>28</sup>. Given the difficulty of measuring the impact of research, discussed elsewhere, it is not possible to say that the formal adoption of an innovation approach enabled CPHP to have more impact than other RNRRS programmes, or indeed more impact from its later projects than from its earlier ones<sup>29</sup>. However, as with many other programmes with a less explicit approach, there were significant changes in the nature of the outputs and outcomes. The researchers in developing countries almost without exception felt that it was a significantly better way of doing research than before and that it had many advantages over the previous ways of doing research<sup>30</sup>. In particular it represented a significant increase in the *types* of partners, going far beyond “partnering” between northern and southern research institutes. This involved taking a proactive approach in assisting institutions to form outcome orientated ‘coalitions’ and ‘capacity building’ interventions in the development and monitoring of projects. At best, it demonstrated how the perception of the research problem evolved and indeed the nature of the research itself as the need and views of the wider network of actors became more fully involved in the process.

Although for CPHP, this approach only became explicit towards the end of 2002, it is interesting to note that a number of projects prior to this date had many of the characteristics of the innovation approach. Perhaps the most extreme example of this was the interaction between the Fruits of the Nile company in Uganda and NRI. Unlike many traditional research projects which are largely supply driven, this Uganda based small

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<sup>26</sup> Given the relevance of animal health to livestock production it would have been highly unusual had they not found appropriate complementarity, but as far as we know there were no systemic demands placed on them to do so.

<sup>27</sup> The project aims to maximise the impact of previous research by RNRRS programmes (CPP, LPP, CPHP, NRSP) within potato-based farming systems in Bolivia.

<sup>28</sup> *Journeying from Research to Innovation: Lessons from the DFID Crop Post Harvest Research Programme's “Partnerships for Innovation”*, FINAL REPORT, January 2006, by Andrew Barnett, CPHP.

<sup>29</sup> Indeed the LTS reports one critical comment from a researcher involved with the CPHP that the system was too formal.

<sup>30</sup> This was less true of UK based researchers who felt discriminated against. Some NRI staff made it clear to the RNRRS evaluation just how upset they were with aspects of the new approach. See LTS, page 371. Though other NRI staff, such as Dr Andy Hall were pioneers in adapting the IS approach to agricultural research.

enterprise requested technical advice from NRI for improving the drying of fruit for export to the UK. This case exemplifies the “demand driven” innovation process. They broadly knew what help they wanted, and had existed as a business for some time. There had been an ongoing NRI research project that addressed these issues (R5539CB starting in October 1992 and ending in 1996) and they were therefore well placed to respond to Fruits of the Nile’s request. This intervention was said to be critical in enabling the Fruits of the Nile company to thrive. However the company has many unique features that has enabled them to break into the UK market, and which make this particular scheme difficult to replicate (not least because of strong trust relations between the partners and consequently low transaction costs). The company has also sought and received technical and other inputs from many other sources (particularly associated with the Fair Trade movement)<sup>31</sup>. This instance illustrates the nature of opportunities that arise during programme life that require flexibility in approach.

### **Other elements from the Innovation Indicators**

The numerical score from the programme managers suggests that most felt that they were less successful in making investments to improve the wider innovation system and to support intermediary functions (both scored at around 3 out of a possible 5)

The following examples illustrate the “intermediation” indicator of the innovation systems approach. These projects were funded by CPHP in India and were associated with the NGO International Development Enterprises (India)<sup>32</sup>. IDE acted as an “intermediary” that facilitated the interaction between the many actors necessary to innovate in crop post harvest systems in ways that benefited relatively poor farmers. IDE came to understand from the producers that a major bottleneck in the marketing of tomatoes was the lack of appropriate packaging. A separate CPHP project had noted the need for a series of innovations that were needed to enable tribal people to add value to their crops and market them to large scale food processors<sup>33</sup>. This latter project appears to have had the greatest “institutional innovation” at the University as the formation of a coalition with IDE and a local NGO that were able to articulate the needs of the tribal groups. It was reported that IDE was able to induce much more rapid (and continuous) interaction with the tribal people and the CPHP engineered coalition was far more flexible than the government innovation system in that they were able to exploit opportunities as they emerged. For instance the project initially focussed on pineapples, but as the research progressed it became clear that other products – tamarinds, juices etc – were far more promising.

Even where the collaboration is more forced (or rather inspired by the programme management!), the results can be dramatic both in terms of impact, but more importantly in the way institutions work. This is illustrated in the CPHP sorghum project in Hyderabad. There have been many efforts over the years to improve the

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<sup>31</sup> [http://www.fmfoods.co.uk/tw/partner\\_uganda.htm](http://www.fmfoods.co.uk/tw/partner_uganda.htm). In January 1995, Fruits of the Nile held a series of seminars on Running Solar Drying Businesses in association with the Natural Resources Institute (NRI) of the UK, and the Kawanda Agricultural Research Institute (KARI) in District Farm Institutes in Uganda. A mixture of hands on practical training in the construction of solar driers, and the processing of the fresh fruits as well as in business management, these seminars were well attended and have led to the publication of a manual on Solar Drying Businesses (July, 1996).

<sup>32</sup> IDE is an NGO that is best known for its very commercial approach to the supply of millions of treadle pumps in India.

<sup>33</sup> They were able to take advantage of selling semi-processed products to OMFED (The Orissa State Cooperative Milk Producer’s Federation Limited which is an apex level Dairy Cooperative Society to promote, produce, procure, process and market milk, milk products and other produces for the economic development of the rural farming community in Orissa – see [www.omfed.com](http://www.omfed.com)). They had not felt this was possible at the outset of the project.



income to poor farmers who grow sorghum. The latest CPHP funded project enabled the researchers at ICRISAT to work in novel ways with poultry feed manufacturers, to convince them (with high quality science) that sorghum that was not fit for human consumption (due mainly to mould) could safely be fed to chickens and that could substitute for high cost maize in chicken feed<sup>34</sup>. This coalition massively strengthened the “demand side of the system”, and introduced mechanisms that could unleash the huge technological capacity within the CG system. The involvement of the feed manufacturer changed the nature of the research, both in terms of demanding research results sooner and demanding the results in terms of “part by part” recipes, rather than in terms of micro nutrients that the researchers wanted to supply. This illustrates our indicators 3 and 5 – the latter on financially sustainable delivery systems - as innovation could be integrated within the existing market and supply chain.

The other NRRS programmes similarly illustrate aspects of best practice in the IS approach. For instance, it would appear that the Plant Sciences Programme (PSP) undertook a number of tasks to improve innovation in varietal selection and plant breeding. This process involved changing the rules of the game (institutional learning) and strengthening elements of the innovation system to reduce the process of getting new varieties to farmers from the traditional 12-13 years to nearer 7 years in Nepal<sup>35</sup>

The evidence from the programmes does not support the view that the innovation system approach is more applicable to certain problems than others. But it does provide significant evidence that the applications cannot be routine and identical across all programmes. Another nuance that the innovation systems literature has not been well elaborated is the difference between the development of new technology and devices, and knowledge that stops or reduces existing non-productive approaches to a problem.

An excellent example of the latter is the work done by the AHP on tsetse fly control and eradication for improving animal and human health and leading to increased benefits for the poor. The problem of tsetse fly infestation, the negative impact on health and incomes of large numbers of poor people, and various approaches to improve the problem is well documented in the work of AHP. Here we comment on one set of interesting outputs produced by AHP where the programme was instrumental in bringing together the scientists, policy makers and NGOs to confront their very different perceptions on the nature of the problem and the best approach towards solutions. The resulting publications convincingly demonstrate that certain approaches are not useful, unproductive and wasteful while a combined approach, varied to suit the local conditions and the resources are likely the best way forward. This particular output will not show up as an innovative product in the market. Its value will lie to the extent that the best knowledge is translated in practice, and in resources saved by abandoning less useful approaches. Its final impact will depend on the new resources allocated to the resolution of the problem, on actions taken by many actors over the next decade, all issues outside the control of the programme. While we support the work done as potentially very useful it may not show up with outstanding impact in the near term. The same resources could possibly have been spent on demonstrating a very short term local impact. We could place these examples within the indicator 8, where the work carried out changes the “rules of the game”.

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<sup>34</sup> The feed manufacturer sells approximately 3,000 tons of poultry feed a month. He currently is able to replace all the maize with sorghum (plus 3% stylo – a green leaf - to improve the colour of the chicken meat as this is what the buyer wants). The sorghum is purchased in lots as ten truck loads a month from a middle man. The Farmers Federation is also involved in the coalition to organise Farmers Clubs to sell sorghum in bulk to the feed manufacturer and to improve the quality of the grain supplied. The coalition is said to enable the “the farmers now get access to the research director”.

<sup>35</sup> Synthesis Study on Capacity Development by Frank Almond and Dan J Kisauzi, 20<sup>th</sup> November 2005, page 11, CPHP, citing Joshi et al 2005.



The work of the AHP, where it determined that while research on vaccines was needed and has high potential, it required funding levels far exceeding those available through the programme, and required larger partnerships. The programme decided to put its resources into developing a Global Alliance for Livestock Vaccines (GALV), which has been established and is beginning to move forward with a new CEO. While results are not yet in this is clearly a new way of driving the required innovations than could not have done by AHP alone. The programme managers viewed their contribution to indicator 8 more modestly giving it a mean score of 3.

We found the programme managers scoring their role and influence in the indicators 5 (financially sustainable delivery systems exist) and 9 (infrastructure strengthening) to be the lowest at around 2.6 and 2.3 respectively. This is not surprising as one manager reported programme rules expressly prohibited such wide investment of funds.

We conclude this section by stating that while the innovation systems approach throws up a series of questions that help make decisions, yet these are not simple choices and cannot be made routine. This process can be seen as being similar to diagnosis of a patient performed by a physician. This analogy suggests the need for holistic diagnosis, and the need for “generalists” before more specialists. While this process can be assisted by a set of procedures, there is likely to be no substitute for the experience and judgement of seasoned and experienced persons on the application of the procedures. In essence common sense suggests that much of this tacit knowledge cannot be codified into a simple set of action points (if it could, there would be no need for physicians).

## LEARNING LESSONS

Despite the huge diversity between the programmes, and indeed between the RNRRS programme and other parts of DFID’s research portfolio, we have illustrated that faced with the common set of demands from the funder, they all faced a set of common challenges and evolved in many similar ways, though with different degrees of emphasis, formality and speed. Yet there appears to have been little systematic ‘institutional learning’ between the various RNRR programmes. Though we have found that there was some fortunate and accidental learning that took place because of overlapping people across some programmes – some through formal networks as the common PAC for all fisheries projects, and the annual meetings that DFID organized in earlier years. The lack of systematic learning seems in part because this function was initially kept within DFID and DFID was unable to tackle this systematically due to competing demands on staff time and its own changes. But it was also no doubt due to the ‘success’ of the competitive research model, in which incentives militate against collaboration with past and possibly future competitors. At the same time DFID’s annual meeting of scientific advisors became more internally focused – in part no doubt because they were concerned not to favour some potential bidders above others by including them in internal discussions. But as time went by and staff numbers were reduced, DFID’s capacity to carry out this function cross programme institutional learning diminished until in the end it was contracted out. It is clear from the NRSP web site that its objectives were very tightly defined by DFID, and that at no time was it their job to learn lessons across DFID’s RNRR programmes

An unintended consequence of the shifts within DFID, changes in priority, and the reduction in DFID advisory staff (and the need to treat all potential bidders equally), was a widely reported perception that DFID was “hostile to science”. Indeed, it has been commented that “It is curious that as DFID’s language relating to research, partnerships, ownership, poverty has become more sophisticated, its actions have become more simplistic”. The IS literature would suggest that DFID must in some way “partner” with the researchers it

finances (and the knowledge generated), and indeed the wider international community. It is just not an option to “contract out its brain”. We believe that even with a reduction of the “head count” within DFID, investment is required to continuously “learn the lessons” that are relevant for DFID and its research programmes and to its purpose of poverty reduction. At one level this might be achieved through appropriate DFID representation on the governance systems of the research programmes, but it is also likely to require a dedicated team (externally if need be) whose function is not to monitor financial and management issues, but to learn the lessons from both the process and product of the research DFID finances. DFID has the capacity (and probably the moral obligation) to feed this knowledge into key “pressure points” of the international development process.

A general finding is that the larger programmes were able to invest more resources systematically to develop formal systems that assisted their evolution towards an IS framework. The smaller programmes such as the fisheries developed fewer formal processes and were guided more by the judgements of the programme managers. The common PAC for all fisheries projects, the deliberate overlapping memberships in the PAC of AHP and LHP allowed a considerable degree of transfer of experiences. All programmes have invested in impact studies at considerably varying scales, with the PSP leading with 17 such studies. We were able to look at a small number and found it surprising that they could not state with greater conviction the impacts of the programmes.<sup>36</sup> The reasons for this are several. Some that can never be solved are due to the inherent nature of the difficulties of impact evaluation of research and they will take too long to discuss here<sup>37</sup>. There are two more practical issues that should be better addressed in any future programme. We have already commented that many issues were to be analysed by the NRSP programme and that could not happen. When the programme suggested doing their own impact studies they were initially told by DFID not to do so as internally funded studies would not have credibility. In the end a small number of studies were done hurriedly.

The second problem stems from the desire for studies that answer every possible question that can be raised and with the highest degree of experimental rigour. For instance in one case of new seed development, it is relatively useful and not too difficult to undertake a study on the number of adopters, the performance of the new seeds, their outputs, impacts on income and other pertinent variables. The question becomes what are the other pertinent variables – should higher seed production lead to more and stable incomes, does that lead to better food for the family, lower malnutrition, higher or lower work load for women, greater school attendance and so on – where should the boundaries be drawn? The larger the boundaries the more difficult are the measurements and also more indirect and weak the impacts from the new seeds. Thus what is important as “good” social science is often an enemy of useful decision supporting studies. Programmes and programme managers need a number of the “quick and dirty” studies as well as more elaborate ones. The former were almost absent and some form of cross programme learning could have empowered the managers to undertake more of them.

## CONCLUDING POINTS

This brief review of such a wide range of interesting and valuable experience provides a number of principles and criteria that could be of use to both DFID’s Central Research Department (CRD) in framing new calls for research, and in guidance to prospective research programme and project managers in responding to these calls.

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<sup>36</sup> This was also stated in the LTS evaluation.

<sup>37</sup> These issues are discussed in the Surr report. (see bibliography).

Much valuable work has been carried out by the RNRRS which will continue to have many favourable consequences, even if the direct poverty reducing impact is difficult to attribute to the research. DFID's current policy of funding a "facility" to add value to this massive resource is certainly supported by the findings of this review.

The Terms of Reference require that the lessons learned are set out under a number of headings

### ***Key lessons***

- It is critically important (as the RNRRS evaluation also concludes) for DFID to specify clearly what it wants to achieve from its research investment. But it is probably the case that DFID wants more than just poverty impact from a research fund intentionally located at headquarters. This synthesis supports the view that centrally funded research should provide "impact plus public goods, both national and international" together with some elements of capacity building thrown in.
- If DFID wants poverty impact, this is most likely to be achieved through adequately functioning "innovation systems". If innovation is the objective, and we think it should be, then the world has a huge experience about how to do it. This is summarised as the Innovation System approach.
- But the innovation systems literature tells us that innovation of any kind is going to be difficult with existing framework conditions and lack of infrastructure facing many developing countries. It is unlikely that individual programmes, let alone projects can buck international trends that are operating against poor people in renewable natural resource systems.
- Many of the elements that make up the 'innovation systems approach' have been increasingly incorporated within the different RNRRS programmes as the emphasis on 'poverty impact' has strengthened in recent years. But this report suggests that the development of these elements has been unsystematic across the different RNRRS programmes while individually many followed logical paths based on their own historical endowments. The IS approach provides both a clarifying framework, and some policy directions but is no panacea. The IS framework provides valuable insights as why innovation does and does not occur, and indicates those actions that managers of research programmes can take that are most likely to be effective in bringing new ideas, and technologies into use – that is, to achieve innovation.<sup>38</sup>
- The value of the IS approach is likely to be increased if it is combined with the insights derived from political economy (what DFID currently calls "drivers of change")<sup>39</sup>. Such analysis draws attention to the incentives, disincentives, and questions about whose (research) priorities, are to be met, and who wins and who loses from the process. Effective innovation requires a shift of power from a narrow to a wider set of actors.
- The essential prediction of the innovation model is that the nature of the research will change, through continuous interaction between researchers and other elements of the innovation system. This requires a very flexible and evolutionary approach to programme finance and management.
- A systems approach in general and an initial "system diagnosis" in particular are crucial. The

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<sup>38</sup> We do not agree with the view that the IS is just another fad and does not encapsulate best practice.

<sup>39</sup> This important conclusion comes most forcefully from the brief diagnoses of the national systems of innovation in the area of Crop Post-Harvest.

system diagnosis can be simple or complex (adopting different ‘fractal levels’ of analysis depending on the resources available). But it requires vision of the strengths and weaknesses of the system involved in effective innovation.

- Some capacity building elements will be needed in any future innovation programme. These issues are covered in another synthesis report.

### ***General thematic development messages***

- The innovation approach requires “participation” with a wider range of key actors than are conventionally regarded as end users<sup>40</sup>. There is a wide experience on this.
- Successful innovation requires changes in the governance of the research programmes to prevent “capture” by any one particular interest group, for instance in terms of widening the range of interests represented on both national and international Programme Advisory Committees, and in terms of deepening the nature of “partnerships” to increase transparency, communication and the allocation of resources (there are so many interpretations of “partnership” that it probably should be avoided).
- If DFID’s ‘research investment’ is set in an innovation framework, this suggests more conscious efforts (and expenditure) to form links with other donors (think about basket funding), and the facilitation of research funding groups at the national level (round tables) that include governments, Foundations etc. It also suggests finding ways to harness the comparative advantage of the UK and other industrialised countries (including through the internet) to this purpose (financial leverage could be usefully included as an objective of DFID’s ‘research’ investment).
- The need to involve additional players, combined with the need to attain a critical mass of effort suggests that within area programmes there will need to be larger investments (fewer but larger projects, if not programme funding).

### ***Evidence Based Lessons learned***

- Procedures for implementing an innovation approach to research management are now well known.<sup>41</sup> But it is difficult to codify the tacit knowledge of experienced researchers, analysts and managers.
- The RNRRS programmes provide a great deal of experience of the pitfalls to be avoided in implementing an IS programme. Some of these are documented, but learning remains to be done.
- The innovation approach implies programme managers going beyond specifying “up take pathways” to more proactive interventions to enable the key actors to work together and to strengthen the weaker elements of the system to facilitate innovation. There is some confusion about the costs involved. These are not ‘overheads’ that need reducing, but rather investments in capacities that are necessary for innovation. Only in those innovation systems that are well resourced, is a reactive approach to research funding possible.
- There is a need to differentiate between the audiences (DFID, Programme Managers, researchers, scientists).
- Dangers arise from being overly focussed on impact at the local level. But even innovation

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<sup>40</sup> Including manufacturers, traders, regulators, extension agents and so on depending on the area of innovation

<sup>41</sup> These are mainly undertaken by CPHP, but this review suggests that a great deal can also be learned from DFID’s other research programmes.

projects that have a large impact in reducing poverty can also provide both national and international “Public Goods”. But the evidence is that in order to achieve these public goods it is necessary to invest explicitly in this learning process to extract the higher level generalisation both about the process (programme management and innovation) and the content of the innovation process. The cross programme experiences suggest that it probably needs experienced specialists who can link local research results to the wider international research and policy experience.

### ***Challenges Ahead***

- The need to invest in learning. A missing element in the entire RNRRS experience is any ongoing, systematic cross programme resources and efforts to learn from experience and use the knowledge gained to strengthen the evolution of the programmes. Those activities that there were did not work very well. Not only is there more to be learned, but an essential feature of the IS approach is to invest seriously in monitoring the research management process (quite different from monitoring finances and compliance) in future and feeding back the lessons learned<sup>42</sup>.
- A critical challenge for DFID is whether to build on local institutions within developing countries to improve innovation or to set up separate systems that are UK based. A related question is whether to separate the management of research from doing research. The innovation literature would suggest emphasis on intermediary organisations (and therefore a separation) and the development of joint partnerships based on local institutions supported by one or more external partner. An objective of DFID’s investment would be the creation of an improved innovation system on specific areas at the end of ten years.
- The challenge of identifying and utilising the UK’s comparative advantage. The RNRRS programme supported by DFID achieved a level of innovativeness in the management of the research that has led to the creation of useful capacity in this difficult and demanding task of managing and delivering results from research to development impact in both the UK and a number of partnering institutions outside the UK, mainly in developing countries. This capacity is an important asset for both DFID, other international institutions working on development, and for many of the developing country national governments. It is important for DFID to consider the ways in which this asset can be best used in the future development endeavours by itself and its development partners.
- Linking research funded by DFID’s Central Research Group with DFID’s activities in developing countries. The devolvement of responsibility for the bulk of the aid programme to DFID offices in developing countries, together with the trend to budgetary support sets a difficult context in which centrally funded research can operate and have an impact. Certainly innovation theory would suggest the need for linking these parts of the system. But more importantly it suggests that DFID itself has a major role (and responsibility) to feed the experience of DFID funded research into the international development process. This goes far beyond admirable schemes such as ID21 and SciDec.net, and needs to address issues of “ownership” and the utilisation of existing and yet to be created networks in which DFID is

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<sup>42</sup> Innovation theory stresses Bounded Rationality: Although much of economic theory assumes optimal and rational behaviour, NSI accepts that in practice decisions makers do not (cannot) know everything and do not interpret perfectly all they do know. It has been recognised for a long time that “the whole life of policy is a chaos of purposes and accidents, it is not at all a matter of the rational implementation of the so-called decisions through selected strategies”, Edward Clay and Bernard Schaffer (1984) **Room for Manoeuvre: An Exploration of Public Policy in Agricultural and Rural Development**.

involved, *qua* UK government. This will be a challenge, but one that can be dealt with by intelligence and money.

- A major constraint to full commercialisation of DFID financed research has been the programme's difficulty to cover the risks that the private sector is exposed to when trying new technology or approaches<sup>43</sup>. It will be a challenge to find ways of financing these activities, and for DFID to decide how far along this route they are prepared to go in such public/private partnerships.

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<sup>43</sup> For example in the CPH Programme with the testing cassava-based glue in the card board box industry in Ghana and test shipments of sweet potato from Uganda to the UK.



## **ANNEX 1 – Terms of Reference**

### **Guidelines for Synthesis Studies of the Renewable Natural Resources Research Strategy**

#### **Purpose**

Throughout its lifetime the ten programmes of the DFID Renewable Natural Resources Research Strategy (1995-2006) have documented wide-ranging issues and lessons learned. These need to be brought together in an appropriate form to inform the design and content of future work. This is especially important for future planning of DFID funded research.

The purpose of the cross-programme synthesis studies is to distil the experiences and lessons learned emphasising common areas and issues including positive and less positive experiences. They will cover technical, institutional and policy themes.

The studies should address key lessons, general thematic development messages, evidence based lessons learned, and the challenges ahead. They need to capture lessons from individual programmes as well as across the different programmes.

#### **Target Audience**

The audience will be DFID and the wider development community, including:

- Central Research Department Research Managers
- DFID advisers and managers
- DFID Policy Division Teams
- Other Donors
- External Stakeholders in DFID Research
- Other research-commissioning organisations
- Research-implementing organisations

#### **Products**

In all cases, a study report is required. There is no length requirement to the study report, but if it exceeds 10 pages of text (excluding annexes), a separate executive summary must be provided of less than 10 pages in length. Submission to CPHP of the project report/executive summary should be by end of November 2005.

Submission to DFID by the CPHP of the summaries should be by the end December 2005. DFID may also then consider a Symposium early 2006 with presentations from the programmes on the themes and launch of a book of the summaries.

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In addition to these documents a total of 37 projects were submitted by the programmes with over 50 project documents, a number of annual reports and websites were reviewed and not individually listed.

## INTERVIEWS

1. Dr J Palmer Forestry Research (FRP) Phone interview November
2. Chris Mees and Robert Arther FMSP. 17th November
3. Andrew Ward and Kerry Albright of CPP team 17th November, Dr F. Kimmins Not available.
- 4 Chris Floyd, NRSP 17th November
- 5 Dr A.P.M. Shaw for Ian Maudlin, Animal Health 18th November 1100
- 6 James Muir; Aquaculture and Fish Genetics 18th November 1400
7. Tim Donaldson, 20th November, CPHP

8. Frank Almond, 20th November

Dr. J. Sanchez (PHFRP), Dr J.I. Richards (Wyn) (LPP) and Dr C.M. Stirling PSP could not be available for interviews. There were 9 questionnaire responses and seven interviews. They covered over 80% of the over all programme by the budgeted expenditures.

### ANNEX 3: CONCEPT BRIEF and QUESTIONS

The RNRRS has been operating from 1995 to 2005, with ten (originally eleven) individually contracted research programmes, which have collectively supported over 1600 research projects. There is already a vast amount of information available with regards to the RNRRS. The RNRRS framework has been characterised by significant changes and evolution of the programs over the period. This has been first driven by changing priorities in DFID, as the donor, which stressed “research” and “scientific publications” initially but following the White Paper in 1997<sup>44</sup>, laid greater emphasis to the poverty impact of research. This resulted in a 1998 review of the RNRRS programme that emphasized the importance of generating benefits for the poor. Although DFID did not use the specific language of innovations in the 1997 or 2000 White Papers they did contain many of the ideas. But these terms have been made more explicit in DFID’s recent research strategy documents and consultations<sup>45</sup>. This approach is probably now the dominant paradigm in research funding for most OECD countries and has recently been adopted by the NEPAD Ministers of Science and technology.

There is a great deal of literature on the relationship between research and innovation, particularly in OECD countries. This literature contrasts two opposing models - the “linear model” in which research is completed and then “disseminated” to end users through some form of extension to applications; and the “Innovations Systems” model<sup>46</sup> in which users of knowledge and suppliers of knowledge interact from the outset of the research to ensure that innovation takes place. The two contrasting models are really simplified mental constructs of a highly complex phenomenon and neither truly describes practice in any pure form.

#### What is Innovation?

Innovation as used here and in practice means the **use** of new ideas, new technologies or new ways of doing things in a place or by people where they have not been used before. The emphasis is on the word “use” and the distinction is made between ‘inventions’ (creation of new knowledge that can be applied which is normally the domain for research) and ‘innovation’ (in the sense of first commercial use or non commercial use, in sufficient scale, beyond field experiments or demonstrations) is crucial. Experience over many years shows that “working with and re-working the stock of knowledge is the dominant activity in innovation”<sup>47</sup>.

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<sup>44</sup> Eliminating World Poverty: A Challenge for the 21<sup>st</sup> Century”

<sup>45</sup> For instance see Martin Surr, (team leader), Andrew Barnett, Alex Duncan, Melanie Speight, with David Bradley, Alan Rew, John Toye, Research Policy Paper. DFID, November 2002. [http://www.DFID.gov.uk/Pubs/files/pov\\_red\\_pol\\_paper.pdf](http://www.DFID.gov.uk/Pubs/files/pov_red_pol_paper.pdf). And DFID’s Response to Electronic Consultation on the proposed Strategy for Research on Sustainable Agriculture, 2005, <http://www.dfid.gov.uk/research/srsa-response-final.pdf>.

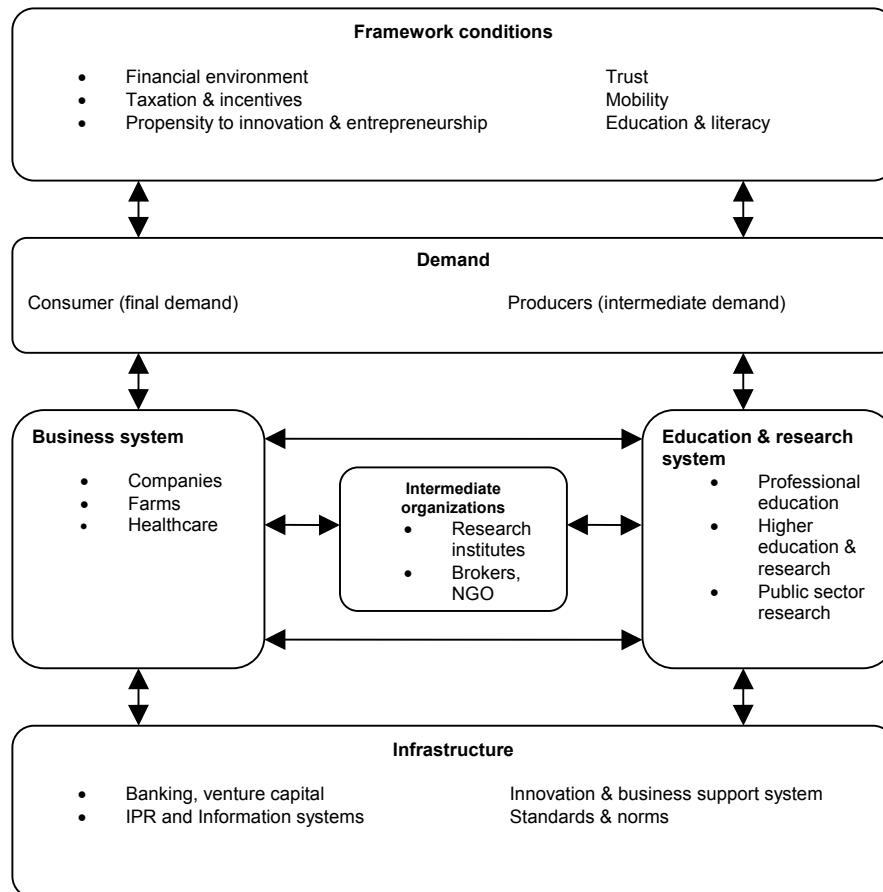
<sup>46</sup> Also sometimes called a “knowledge systems” approach. They both follow from OECD and other research on National Systems of Innovation.

<sup>47</sup> Erik Arnold and Martin Bell Some New Ideas About Research for Development, in Danish Ministry of Foreign Affairs: Partnership at the Leading Edge: A Danish Vision for Knowledge, Research and Development (April 2001). Page 288.

[http://www.um.dk/NR/rdonlyres/7CD8C2BC-9E5B-4920-929C-D7AA978FEEB7/0/CMI\\_New\\_Ideas\\_R\\_for\\_D.pdf](http://www.um.dk/NR/rdonlyres/7CD8C2BC-9E5B-4920-929C-D7AA978FEEB7/0/CMI_New_Ideas_R_for_D.pdf)

**Innovation Systems:**

The ideas associated with systems of innovation as they apply to developing countries are well summarized by Arnold and Bell<sup>48</sup>. They provide the highly simplified diagram of the major elements of a successful innovation system:



In a very crude sense the boxes on the right hand of the diagram represent the “suppliers” of new codified knowledge<sup>49</sup> while those on the left represent the ‘users’ of knowledge (who may well also provide essential tacit knowledge). The diagram illustrates the importance of both the “supply push” of new knowledge from the research community and the “demand pull” from the users of new knowledge. Successful innovations require constant interaction between the organisations and actors on both sides of the diagram. It also suggests the need for systematic processes to understand the “demand”, not only from poor end users but also of the other actors in the system such as equipment manufacturers and suppliers, product and service retailers, the financial institutions, government and so on.

<sup>48</sup> See previous reference.

<sup>49</sup> Codified knowledge is said to be knowledge that is documented, or in some other way systematised. Contrasted with “tacit knowledge” that is related to human knowledge and experience.



The diagram also highlights the importance of networks, coalitions and partnerships across organisations and the need for effective communication channels linking the organisations and individuals that make up the system. Such networks can be both formal and informal, and both are important. Informal links appear to be particularly important, as they help foster trust between the various parties, and thereby lower the transaction costs of the interactions. Trust relations result in both parties knowing each other's needs, knowing the nature and quality of the goods and services on offer, and reduces the need for formal and legal contracts and thereby reduce transaction costs. The value of networks and trust relationships has been observed to lead to the "clustering" of actors in the same location for certain types of innovation (such as Silicon valley in California, the Cambridge Science Park, or even the surgical instrument cluster in Sialkot, Pakistan<sup>50</sup>) Network capacity can be more important for successful innovation than the capacity of individual researchers or the organisation within which they work.

The importance of *Intermediate Organisations*, shown at the centre of the system diagram, lies in providing a bridge between users and suppliers, searching the range of options within existing knowledge to find what best meets the needs of specific users and even determining what new knowledge or new combinations are required. This is the opposite of the inclination of technology proponents who tend to assume too quickly that a particular technical fix provides the solution the problem. This task of intermediation can in principle be carried out by any of the organisations listed on the diagram, but they tend to be undertaken by consulting or design organisations, brokers (sometimes known as "technological midwives"), and even non-government organisation (NGO) or applied research institutes and research associations (when operating in consulting or facilitating mode). But as Arnold and Bell suggest they "typically have low status compared with universities and basic science institutes".

It is often the ways of working, aspects of culture, the social value placed on innovation and entrepreneurship, financial systems and banking "ethos", that most effectively explain the difference between countries that innovate and those that do not. Weaknesses in the infrastructure often form the major constraint to the effectiveness of much research in developing countries.

The Innovation Systems literature provides a great deal of insight into the 'learning' processes that need to take place both at the level of institutions and organisations, into the many decisions necessary for innovation, and the capabilities required to innovate. To summarize, the essential insight of the Innovations Systems approach is to switch attention from "research" to the "processes of innovation"; research remains important but only one element within the system, "nested" within a set of activities and organisations that are interacting (or ideally should be); the importance of a large number of key actors and institutions involved with successful innovation, and the importance of the links between these actors that enable them to operate as an effective 'system' is highlighted. This is in contrast to the more 'linear model' where funds were typically allocated to researchers to do 'research' and then, often in a separate exercise, the research results are handed to 'extension agents', trainers, or 'communications professionals' to deliver them to 'the target audience'. In the new model the definition of the next step in research and action change with the experience from previous steps.

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<sup>50</sup> See Hubert Schmitz Editor (with Khalid Nadvi) *Industrial Clusters in Developing Countries*, Special Issue, **World Development**, 1999.

### ***How is Innovations Systems thinking applied?***

Systems ideas and systems thinking cannot be simply “bolted on” to research initiatives and there are no simple recipes. The ideas have to be embedded within a long-term programme and in the project design. Successful innovations require the knowledge of the appropriate systems and subsystems, working with a range of actors at multiple levels, and, with flexible linkages between the network of knowledge providers, users and intermediaries.

Clearly, communications and extension remain important parts of the innovation process, however with greater attention to the needs of different users. Project interventions must be flexible, and iterative, and incorporated appropriate understanding of partners and their institutional setting, probably involving greater use of participatory process approaches. Integration of local knowledge is important as innovations take place all the time across all societies, with and without donors, and formal research systems. Farmers (and other users and producers of knowledge) have been shown to contribute importantly to the innovation process with their knowledge of local circumstances and detailed experience. But participation needs to involve a wider range of participants, not just the end users and poor people. These other partners will almost certainly include manufacturers, marketing and credit organisations, government regulators, and city authorities and so on.

All research inevitably takes place within an innovation system whether or not the systems are explicitly acknowledged. A major difference between countries is that in some countries these systems work much better and in others they do not. The “demand” side of the system is often weaker in developing countries while much of the policy intervention in the support for “research for development” has focused on the obvious weaknesses in the “supply” system. In industrialised countries most research is carried out by and within private companies allowing for better articulation of their needs. In poor developing countries research together with many other welfare improving investments are all under funded. Further almost all research is funded by the state in public institutions and the “demand” placed on research organisations by actual or potential users of knowledge has often been weaker. Poor people and poor producers in particular, have additional difficulties in specifying their needs for new knowledge, and obvious difficulty paying for it and there by creating effective demand.

### ***Indicators of ‘NSI-ness’***

We have developed a set of nine indicators for this study which we believe incorporate essential characteristics of an IS approach and they provide a template to determine the extent to which Innovations Systems ideas are being applied or incorporated by a programme (or a problem area or cluster). The first six are associated with the innovation process<sup>51</sup>. The last three are more complex and are associated with the “outcomes” that the system achieves.

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<sup>51</sup> To some extent the first six indicators are sequential in the sense that the presence of the later indicators suggests that the activity has more fully adopted an innovation approach. Broadly speaking each indicator is unlikely to be achieved unless the previous indicator is also present.

1. ***Suppliers and users of "Codified knowledge" are centrally involved.*** Does the project contain organisations (or individuals) in some form of partnership (or coalition, or strategic alliance of mutual benefit) that cover both the provision of "codified knowledge" (usually an R&D institution) and the use of such knowledge
2. ***User needs understood.*** Genuine and continuous involvement of all "end-users" (producer, consumer or processor) to assist in the determination of the initial problem and to provide iterative feedback as innovation evolves<sup>52</sup>.
3. ***Investment is made in the "innovation system"***, that is expenditures are made in parts of the system in addition to R&D organisations<sup>53</sup>.
4. ***Intermediary functions are performed*** and/or organisations that perform intermediary functions such as consulting firm, an NGO, or a CBO are actively involved in the project to assist two way communications between knowledge suppliers and users, and/or facilitate the new use of knowledge by the end-user<sup>54</sup>.
5. ***Financially sustainable delivery systems exist*** – checks for, utilises or explicitly develops, a financially viable business model to supply the innovative technology or service (this often involves manufacturers, service providers, credit suppliers, and providers of technical assistance to users)<sup>55</sup>
6. ***Learning results from iterative action research*** – there exists an iterative process that enables the organisations within the system to learn from experience and improve their performance<sup>56</sup>.
7. ***Pro poor innovation takes place*** - new technologies and/or new ways of doing things are observed to take place on a financially, socially and environmentally sustained basis (as a result of the project and that would not have taken place without the intervention) that demonstrably improve the livelihoods of poor people. If this occurs, then the innovations system clearly works effectively.
8. ***Rules of the game are changed*** – The project results in changes in the institutional arrangements ("rules of the game") by which the various organisations in the system operate. This might include changes in the policy of governments or companies, or new ways of doing such as public/private/NGO partnerships. This is sometimes described as “institutional learning”.

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<sup>52</sup> While there is much to commend the recent trend for “participation” with small farmers and other poor people, the innovation approach would suggest that there are other key actors in the innovation process whose needs must be understood including manufacturers, traders, regulators, extension agents and so on depending on the arear of innovation.

<sup>53</sup> for example the “system diagnosis” should indicate weakest areas of the innovation system. Investment to remedy these weaknesses, or the conscious incorporation of actors with the appropriate resources into the network, will produce more “innovation” impacts that spending money in the stronger areas, such as more research.

<sup>54</sup> Research institutions can and do perform these intermediary functions, however if other types of organisation does it, a wider range of technical and scientific resources can be marshalled that best meet the needs of the users. A number of CPHP projects in India adopted this approach by providing the funds through an international NGO that then bought in the scientific expertise as required.

<sup>55</sup> This is probably the biggest weakness in innovation systems involving the supply of new technology in the form of equipment. Many prototypes just do not get into production. But with the deterioration of extension services or advisory services, the lack of a financially viable delivery system remains the key constraint to the delivery of improved practices.

<sup>56</sup> For the RNRRS projects this may well be associated with changes in the project log frame as the diagnosis of the "problem" improves and possible responses - "solutions" – evolve in the light of experience.

9. **Infrastructure strengthened** - the infrastructure that supports and enables the innovation system to operate effectively is strengthened. Examples include (not only are micro credit organisations brought into the network of, but micro credit services are improved<sup>57</sup>.

## METHODS

For this synthesis study we first asked the Programme Managers to describe the extent to which their whole programme exhibits the characteristics of an innovation system approach as described in the indicators above. The Programme Managers were also asked use the indicators and use a numerical score to indicate the extent to which they believed each indicator was to be found in their project portfolio:

- 5 = All: 80% or more
- 4 = Most: more than 50% but less than 80%
- 3 = Many: 25% to 50%
- 2 = Some: up to 25%
- 1 = None at all

	Mean	NON-RESPONSE
Q1	4.29	
Q2	4.29	
Q3	3.17	CPP
Q4	3.71	
Q5	2.67	FRP
Q6	4.00	
Q7	3.17	FRP
Q8	3.00	FRP
Q9	2.33	FRP
<b>Mean</b>	<b>3.17</b>	

Based on 9 questionnaire responses.

Further, the Programme Managers were asked to indicate a small sample of up to three projects (or clusters of projects) in their portfolio that best exemplify most of the indicators (that is, which project(s) would contain the most ticks against the nine indicators). We then analysed the response and followed up with some questions and discussions with the Programme Managers to draw some lessons across the programmes. Examples of the questions include:

- a. Are the differences between the programmes within RNRRS (for instance, in the balance between basic and applied research) largely a result of differences in the problems to be solved, differences in the speed at which change has been implemented, or some other

<sup>57</sup> It has been suggested that this is an outcome, but not necessary an innovation itself.

- reason?
- b. Is the innovation system approach more applicable to certain problems than others? For instance is it more relevant in the development of new technology and devices, rather than policy reform?
  - c. If the innovation systems approach had been used more explicitly would this result in differences in activities between the current and future programmes, and would there be differences in the types of activities undertaken in different countries and in each of the programmes? For instance it is likely that for some problems, the required basic knowledge is available and needs the adaptation of generic knowledge to local conditions. For others, there may not be sufficient generic knowledge related to a specific problem, country or a region for ‘creative imitation’, and there could be good reasons to fund more basic scientific research, in addition to supporting the application of knowledge.
  - d. Is the normal two to three year time scale of projects appropriate?
  - e. If innovation systems thinking depends on constant iterative learning and adaptation, does it require changes in how project objectives are set and the various participants are held accountable?
  - f. How helpful is the innovation approach to the Programme Managers and does it provide useful operational insights at the sub-national, sectoral, and project levels.
  - g. With hindsight, how would Programme Managers have organised their programmes if the maximisation of poverty impact had been the main criterion for project selection at the start of the programme?