



Learning from the Renewable Natural Resources Research Strategy

From research to innovation systems

The Department for International Development (DFID) is widening the scope of its natural resources research by focusing explicitly on innovation systems (IS) to reduce poverty. Many of the elements of the approach were implicit in the 11-year Renewable Natural Resources Research Strategy (RNRRS), which ran from 1995 to 2006, and much can be learned from that experience.

Key messages

- The Innovation Systems (IS) approach is being adopted within DFID's Sustainable Agriculture Strategy. Elements of it were used by its predecessor, the Renewable Natural Resources Research Strategy (RNRRS).
- The IS approach refocuses attention from research to the process of innovation. Research remains important but becomes just one element of a wider system of activities and organisations. The interaction between suppliers and users of knowledge is at the heart of innovation systems, and this ensures the relevance of the research taking place.
- The various RNRRS programmes incorporated elements of the IS approach as they evolved, such as participatory and action research. However, the inclusion of these elements has been largely unsystematic across the programmes, and has varied in timing, degree and effectiveness. Nonetheless, it is important to distil learning from this experience.
- Some programmes found the IS framework useful in providing guidance for research managers wishing to achieve innovation. Although not a panacea, it provides valuable insights as to why innovation may or may not occur.
- The IS framework indicates which actions taken by managers of research programmes are most likely to be effective in bringing new ideas and technologies into use. An initial system diagnosis is vital.
- The IS approach requires a very flexible and evolutionary approach to programme management and finance.
- An essential feature of the approach is to invest in monitoring the research management process and systemised learning.

Introduction

The Renewable Natural Resources Research Strategy (RNRRS) saw significant change and evolution over its life. This included a change in focus from producing research and scientific publications to emphasising the impact of research on poverty. The focus also moved from outputs to outcomes and long-term impacts. At the same time, interdisciplinary research, policy and the livelihoods of the poor received more attention.

Several of the ideas behind innovations thinking have been implicit in the Department for International Development's (DFID's) research policy for many years. In line with this, DFID's recent research strategy explicitly adopts an innovation systems (IS) approach, drawing on its own experience from the RNRRS and wider knowledge.

This Brief explains what is meant by IS, shares the RNRRS's practical experience of IS and identifies the challenges that lie ahead.

Background: what is the IS approach?

The IS approach is becoming the dominant paradigm in research funding for most Organisation for Economic Co-operation and Development (OECD) countries. It has also been adopted recently by the New Partnership for Africa's Development (NEPAD) Ministers of Science and Technology.

There is a great deal of literature on the relationship between research and innovation. The literature contrasts two opposing models – the linear model, in which research is completed and then disseminated to end users through some form of extension service, and the IS model, in which users and suppliers of knowledge interact from the outset to ensure that innovation takes place. It is worthy of note that the two contrasting models are really simplified mental constructs of a highly complex phenomenon and neither fully describes practice in its pure form.

The concept of innovation, as used here and in practice, means using 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 'using' to distinguish innovation from inventions. Experience over many years shows that 'working with and re-working the stock of knowledge is the dominant activity in innovation' (Arnold and Bell, 2001). The ideas associated with IS as they apply to developing countries are summarised in Figure 1.

In simple terms, the boxes on the right hand side of the diagram represent the suppliers of research, while those on the left represent the users of knowledge (who may also provide essential tacit knowledge). The diagram illustrates the importance of both the supply or 'push' of new knowledge from the research community and the demand or 'pull' from the users of new knowledge. Successful innovations require constant interaction between the organisations and actors who form the users and suppliers of knowledge. Systematic processes are needed to understand the demand, which comes

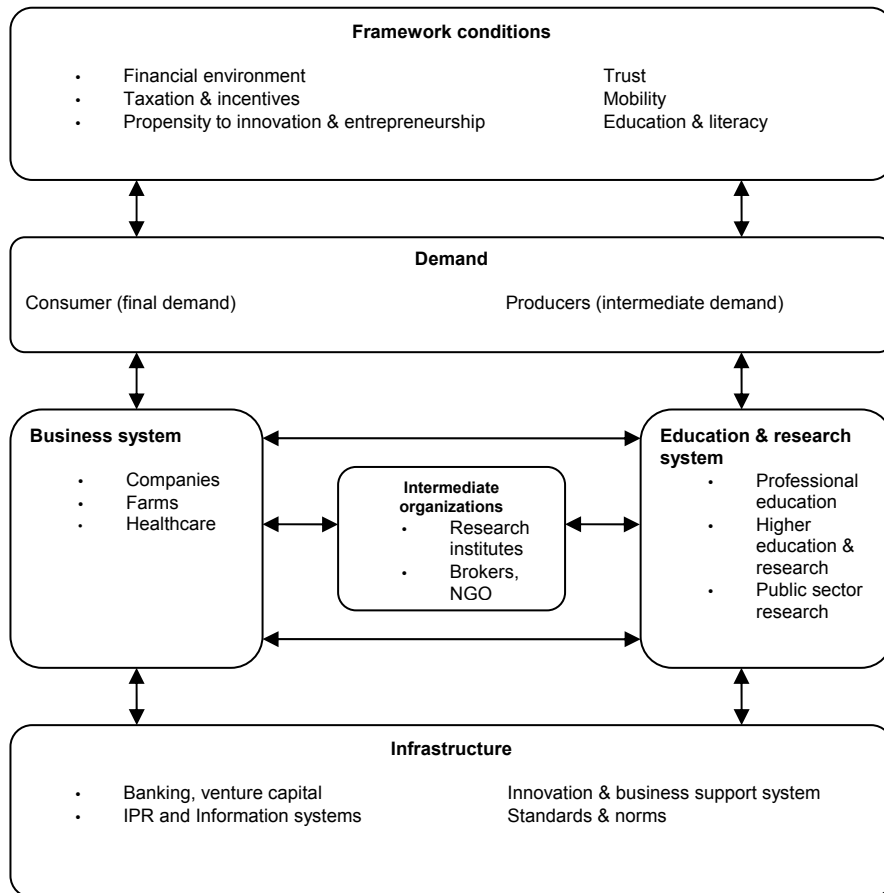


Figure 1. A highly simplified diagram of the major elements of successful IS (Arnold and Bell, 2001)

from a range of different actors, including equipment manufacturers and suppliers, product and service retailers, financial institutions and government, as well as the poor who are the more conventional end users of technology.

The IS approach highlights the importance of networks, coalitions and partnerships and the need for effective communication channels among the organisations and individuals that make up the system. Networks can be formal or informal, and both are important. Informal links appear to be particularly vital, as they help foster trust between the various parties, thereby lowering the transaction costs of interactions.

Intermediate organisations, shown at the centre of the system diagram, provide a bridge between users and suppliers. They help to search the range of options available within existing knowledge and find those most suitable for specific users. They can even determine the new knowledge or new combinations that are required.

These and other essential characteristics of the IS approach are shown in Box 1 (developed as indicators in the course of the research). The first six are associated with the innovation process. The last three are more complex and are associated with the outcomes that the system achieves. Broadly speaking, each characteristic is unlikely to be achieved unless the previous characteristic is also present.

Box 1. Essential characteristics of IS

1. Suppliers and users of research are centrally involved
2. User needs are understood
3. Investment is made in the innovation system
4. Intermediary functions are performed
5. Financially sustainable delivery systems exist
6. Learning results from iterative action research
7. Pro-poor innovation takes place when new technologies and/or new ways of doing things are observed
8. Institutional arrangements are changed
9. Infrastructure that supports and enables the innovation system to operate effectively is strengthened.

Innovation in the RNRRS

Many of the elements that make up the IS approach have been incorporated within the different RNRRS programmes as the emphasis on poverty impact has strengthened. This is not surprising for an approach that tries to build on existing best practice in research management. However, the process has been largely unsystematic with little learning across the RNRRS as a whole.

Essentially, the changing direction and emphasis led to parallel shifts in each of the programmes, away from what is known as a linear model of research inputs leading to applications, and towards a slowly evolving, new and wider set of activities that go considerably beyond the earlier set of work supported. The Crop Post Harvest Programme (CPHP) had the most formal and comprehensive approach to IS (Barnett, 2005).

The first change made by all programmes (at differing speeds) was to strengthen the linkages between the generators and potential users of knowledge. The Animal Health Programme (AHP), for example, from 1998 onwards placed emphasis on the dissemination of knowledge in the South. This led to an examination of the barriers to uptake of new methods and the development of new media and formats for dissemination. Similarly, the Post Harvest Fisheries Research Programme (PHFRP) shifted its focus after 2000, when ‘dissemination’ was considered too passive an approach. Instead, the Programme took up the ‘promotion’ of solutions.

As the RNRRS programmes evolved, they paid greater attention to emphasising the dissemination of outputs of their earlier scientific research. This period saw the development 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.

The new emphasis on reaching the users of knowledge was the first step towards getting them involved more centrally in all programmes. The process of seeking active involvement sowed the seeds for wider partnerships, coalitions and alliances, especially with local research and development institutions and user groups.

As the RNRRS programmes developed, they brought new meanings and characteristics to the

concept of partners and partnerships. Initially, partners were restricted to other researchers, but they changed to include many additional actors. The nature of partnerships evolved too, encompassing greater equality (e.g. over the allocation of resources) and transparency (e.g. over budgets and accountability).

Most programmes undertook several different types of strategic overviews. For example, the Crop Production Programme (CPP) made early use of the cluster analysis tool to begin pruning its diverse portfolio by identifying core problems and a more specific geographical focus. The Programme also began to encourage interdisciplinary research. This led to further in-depth study of the process of uptake and the barriers to it. The result was a new focus on integrated pest management in eastern and southern Africa.

In brief, the different programmes evolved (at differing speeds, to differing degrees and with differing effectiveness) to include a greater share of social science research (thereby reducing the natural science components) and from basic towards applied research. The evolution also covered the following progression:

- A shift to organising research around beneficiary groups
- Priority given to impact rather than the generation of knowledge for its own sake
- An emphasis on participatory processes to establish demand and prioritise research needs
- Greater follow-on and clustering of projects to allow for continuity of research themes
- More emphasis on dissemination and promotion of uptake
- Increased ‘southernisation’, with more southern partners and greater expenditure in southern countries (up to 70% of project budgets in some cases)
- Development of explicit capacity building activities
- Establishment of links with private sector stakeholders as partners and research users.

Programme differences in the IS approach

‘Path dependence’ is a key feature explained in IS literature. In simple terms, this is described as ‘what a company or institution can do today depends on what it could do yesterday, and what it has learnt in the meantime’ (Rosenberg, 1976). In the context

of the RNRRS programmes, this means that each programme evolved mechanisms that encouraged innovation, but the programmes did so in different ways. This was because of their different histories, internal capacities (e.g. social science and other science perspectives) and the nature of the problems they were addressing. For example, the Forestry Research Programme (FRP), with its focus on trees, worked towards a longer time horizon than the CPHP, with a focus on crops. The range of partners in the CPHP was much broader than in the FRP, which worked traditionally with the public sector.

Improving the wider innovation system

RNRRS programme managers felt that they were less successful in making investments in some of the more complex characteristics of the IS approach than the aspects discussed above. The following are examples of good practice.

The Plant Sciences Programme (PSP) undertook a number of tasks to improve innovation in varietal selection and plant breeding. This involved changing the rules of the game (institutional learning) and strengthening elements of the IS to shorten the time-scale for delivering new varieties. Projects in Nepal succeeded in reducing this time-scale from around 12–13 years to nearer 7 years.

There have been many efforts over the years to improve the income of small-scale sorghum farmers in Hyderabad, India. A CPHP project helped the researchers at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) to work in novel ways with poultry feed manufacturers. The researchers were able to convince the poultry feed industry that sorghum that was unfit for human consumption (mainly due to mould) could be fed safely to chickens and could substitute for high-cost maize. The coalition significantly strengthened the demand side of the system and established links among farmers, the private sector and the Consultative Group on International Agricultural Research (CGIAR) system. Involvement of feed manufacturers changed the nature of the research. Instead of providing conventional micro-nutrient analysis, the researchers were asked to produce adaptable recipes in a very short time-frame.

A nuance that has not been elaborated by the IS literature is that of the development of new

technologies and knowledge that stops or reduces existing non-productive approaches to a problem. An example of such an intervention is the work done by the AHP on tsetse fly control and eradication. The work had great potential for improving animal and human health and brought together scientists, policy makers and non-governmental organisations (NGOs), each of whom had a very different perception of the problems and best solutions. While the initiative failed to have great impact in the short term, it raised pertinent issues that could influence major changes in the ‘rules of the game’.

Lessons and challenges

Without indicators of impact it is difficult to demonstrate that one approach to research management has more impact than another. Impacts can be diffuse, cumulative over long periods of time, and difficult to attribute to particular research outputs. Consequently, the lessons and conclusions given here are largely inferred.

It is believed that the IS approach provides a clarifying framework and some policy directions, but it is no panacea. The IS framework offers valuable insights as to why innovation does and does not occur. It also indicates the most effective actions that can be taken by managers of research programmes in their efforts to bring new ideas and technologies into use.

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’). Such analyses draw attention to the incentives, disincentives and questions about which (research) priorities are to be met, and who wins and who loses from the process. Effective innovation requires a shift in power from a narrow to a wide 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 IS. 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 IS approach highlights a series of questions that can influence decision making, yet these are not simple choices and cannot be made routine.

In general, the larger programmes were able to invest greater resources in systematically developing formal systems that assisted their evolution towards an IS framework. The smaller programmes, such as the fisheries programmes, developed fewer formal processes and were guided more by the judgements of the programme managers. The need to involve additional players, combined with the need to attain a critical mass of effort, suggests that greater investment is needed within area programmes (fewer but larger projects, if not programme funding).

One element missing from the entire RNRRS experience was any ongoing, systematic cross-programme effort to learn from experience and use the knowledge gained to strengthen the evolution of the programmes. (This was due partly to the success of the competitive research model, in which incentives militate against collaboration with past and possibly future competitors). In addition, the learning activities that occurred did not work very well. An essential feature of the IS approach is to invest in monitoring the research management process (quite different from monitoring finances and compliance) to feed back the lessons learned.

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 research management from implementation. The innovation literature suggests it is best to emphasise intermediary organisations and the development of joint partnerships based on local institutions supported by one or more external partners.

If DFID’s research investment is set in an innovation framework, it will require a more conscious effort (and expenditure) to form links with other donors and to facilitate research funding groups at the national level that include governments, foundations etc. It also suggests finding ways to harness the comparative advantage of the UK and other industrialised countries (e.g. financial leverage could be included as an objective of DFID’s research investment). In the same vein, DFID has a responsibility to feed the experiences of research it has funded into the international development process.

Additional resources

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About this Brief

This Brief is an edited summary, prepared by Susanne Turrall, of a paper written by Amitav Rath and Andrew Barnett (2005): *Innovation systems: Concepts, approaches and lessons from RNRRS*. www.research4development.info/thematicSummaries/Innovations_Systems_Concepts_Approaches_and_Lessons_from_RNRRS_P1.pdf

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About the Renewable Natural Resources Research Strategy (1995–2006)

The objective of DFID's Renewable Natural Resources Research Strategy (RNRRS) was to generate new knowledge and to promote its uptake and application such that the livelihoods of poor people are improved through better management of renewable natural resources. Through its ten research programmes it addressed the knowledge needs of poor people whose livelihoods are dependent on natural resources production systems in semi-arid areas, high potential areas, hillsides, tropical moist forests, and at the forest/agriculture interface, the land/water interface and the peri-urban interface. The breadth of the strategy programme reflected the wide variety of environments in which poor people live in poorer countries and the multiple routes by which research can reduce poverty.

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