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The Development and Use of the Innovation Systems Framework in India A Northern Perspective

Introduction

This paper discusses the co-evolving experiences of policy research and research implementation in relation to patterns of partnership in North-South collaborative research for development. This presents two perspectives in which the unfolding events need to be discussed. The first perspective is that of a long-term, donor research strategy addressing technical (mainly) and policy (less so) issues in the crop post-harvest sector in India – DFID's crop post-harvest programme (CPHP).¹ The main thrust of this perspective is the way an initially Northern partner/technology-led approach has evolved into an approach more firmly embedded in a national stakeholder context, where technical imperatives have been supplemented by efforts to build new forms of multi-institutional capacity. The second perspective concerns the way dissatisfaction with the earlier technology-led approach resulted in a North-South collaborative policy research project. In this research the innovation systems framework was developed and used as a way of understanding partnership and other institutional issues affecting the performance of research and development

¹The Department for International Development (DFID) is the UK Government department responsible for promoting development and the reduction of poverty.

(R&D) and technology promotion (R&D&TP) activities.⁴ Findings from this policy research have subsequently been applied in the redesign of the CPHP. Consequent changes in programme strategy centre on a conscious decision to reject the transfer of technology model of innovation and the linear conventions inherent in patterns of resource flows and relations that this model implies. Replacing this has been a planned shift to an innovation systems orientation based around the development of coalition projects rooted in the local institutional context.

This paper represents work in progress. Patterns of partnership are still evolving and CPHP's approach remains experimental and, by its nature, process driven. Empirical questions still remain over ways in which coalitions can be best established, monitored and evaluated; the way priorities can be set and resources allocated; and ways in which broader lessons can be learnt and promoted. Nevertheless, even at this stage a number of issues can be discussed with some confidence. In general terms it is now quite apparent that research for development cannot be conceived or evaluated without reference to the institutional context in which it takes place. The notion of research as a process unaffected by the agency role of those producing, interpreting, using and benefiting from the new knowledge and technology created, does not stand up to close scrutiny. This obviously has important implications for the way North-South relationships are structured. This is particularly so given the strongly asymmetrical patterns of relationship that arise for historical, political and resource access reasons.

However, the main message from this paper does not relate to North-South partnerships alone, but to the wider patterns of partnership / institutional context in which agricultural R&D&TP takes place. Contributing to the development of innovation systems embedded in the national institutional environment of developing countries needs to emerge as a guiding principle for

⁴ In this paper we follow the convention in the innovation systems literature of using the term institution as used in the everyday meaning of the word: i.e. as an embedded concept relating to the behaviour of actors in the innovation system. This may include physical organisations dealing with research and development (R&D) and economic activity – research centres, universities, private companies, research foundations, farmers associations, co-operatives and so forth. We follow this embedded concept because, as Edquist and Johnson (1997) point out, generalisations from empirical observations indicate that both 'rules' and 'organisations' are involved in and shape the outcome of innovation. The real problem is that institutions in the 'rules and norm' sense are often intimately related to the nature of organisations, and in one sense organisations help define and operationalise the 'rules of the game'. In other words they are mutually embedded concepts that result in the agency role of innovation actors Hall *et al.* 2001 b. (for an alternative perspective see Rajeswari (2001)).

research for development assistance. This does not deny the importance of international/Northern collaboration in the field of science and technology. However it does mean that capacity building efforts will need to focus increasingly on innovation systems capacity development rather than relying only on the transfer of a narrow set of expertise and associated knowledge and technology. It will be the nature and demands of these systems that will determine the role and contribution that Northern partners could most appropriately make. These systems will be highly contingent on national contexts and patterns of international collaboration will need to vary accordingly.

The remainder of the paper begins by providing the context of this discussion, describing the CPHP the Northern and Southern partners and the historical evolution of projects that led to a research partnership examining the innovation systems framework. Specific details are then provided about the way the partnership emerged and the roles and dynamics that this entailed. Three mini case studies are then presented to illustrate the attempts to operationalise the innovation system framework. These highlight North-South partnership issues as well as providing an opportunity to explore the wider implications of the innovation systems framework for development research assistance. The final sections explains that way this has led the CPHP to adopt the innovation systems framework as its guiding principles, and briefly explores some of the implications of this shift in research policy.

Northern partner context

At the outset it is probably useful to explain the circumstances by which the author – the Northern partner – is involved in the events discussed in this paper. Similarly, making the authors disciplinary and professional interests known to the reader helps giving context to the way events are interpreted and presented. The author has an academic background in agricultural science and science and technology policy and has a specific professional interest in the institutional arrangements of agricultural R&D in developing countries. The author works for the Natural Resources Institute in the United Kingdom (UK), but for the last five years has been seconded to the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) in India. This position involves two roles. The first role is as South Asia Regional Co-ordinator for DFID's Crop Post-harvest programme (CPHP) – it is this role, and the strategy development elements that it involves, that forms the broad context for the discussion in this paper of the development and use of the innovation systems framework. The second role is as a policy researcher, undertaking projects mainly funded by CPHP – this includes

the North-South collaborative project discussed in this paper. The reason that these activities are located at ICRISAT is in part historical, stemming from an earlier collaborative project between ICRISAT and NRI. The location at ICRISAT has also continued because, a generic research management issue, partnership and institutional processes are fields of interest for both CPHP and ICRISAT.

The Southern partner context

In one sense there are a series of separate Southern partners that the CPHP engages with in India, all with different Northern partners. These will be mentioned separately in the context of the mini case studies that we provide to explain the practical use of the innovation system framework. The key Southern partner, however, is the National Centre for Agricultural Economics and Policy Research (NCAP), which collaborates with the author on the policy research project on the innovation systems framework. NCAP is part of the Indian Council for Agricultural Research (ICAR). In relation to institutional issues in R&D, NCAP undertook a number of studies related to changing public private sector roles and relationship in the mid to late 1990's. Notable among these initiatives was a study on the privatisation of extension in India. This study was led by Dr Rasheed Sulaiman. As will subsequently be discussed Dr Sulaiman emerged as the key collaborator. Unusually for NCAP policy analysts, Dr Sulaiman has an extension background rather than a training in economics. This has proved to be an advantage in the type of collaborative research undertaken in the North-South partnership. It is also a distinction shared by the Northern collaborator.

DFID development research assistance context

The DFID CPHP is one of ten centrally (UK) managed natural resources research programmes. These research programmes collectively form DFID's renewable natural resources research strategy (RNRRS), a ten-year research strategy running from 1995 to 2005. The RNRRS has evolved considerably since its inception. This in part was a consequence of the way DFID's agendas have changed during this period. The individual programmes have also interpreted the RNRRS in different ways, and have evolved management strategies to suit alternative approaches and perspective. So for example, DFID is the only programme to have regional co-ordinators located in-country. Despite these differences, the RNRRS provided – and continues to provide – a broad framework in which DFID's research for development assistance (RDA) is planned and managed. This framework has informed to a large degree the nature of North-South partnerships. General features include the following:

- The RNRRS was conceived and promoted as a way of exploiting the UK science base in support of international development. Programme funds were competitively managed, but since the practice was that UK institutions were leading the projects, this was effectively a UK based competitive funded. Project ideas were mainly developed by UK scientists, and where collaboration and consultation took place this tended to be with a narrow set of scientific stakeholders. It was not uncommon for project funding to be approved without any genuine consultation with the named collaborators.
- The structure of the RNRRS programmes also tended to evidence the fact that the strategy was designed to support UK based institutions – the programme was divided along disciplinary lines that tended to conform with the institutional grouping of UK tropical agricultural expertise. Historically this expertise had either been part of DFID itself, or had received core funded prior to the RNRRS. For example, the CPHP area was almost entirely analogous with parts NRI, a privatised former agency of DFID.
- The way the programmes were monitored was in terms of progress in production systems – for example, yield improvement in the semi-arid production system, or post-harvest loss reduction in the high potential production system. The translation of these technical outputs into poverty/developmental impacts was relegated to the assumptions column of the log frame. In effect this meant that the whole institutional context in which R&D&TP took place was assumed to be external to the research process. Furthermore, since it was assumed that institutional roles and relationship were functioning efficiently, examining the validity of these institutional assumptions was seen as beyond the purview of research projects. Capacity building, even in the narrow sense of training, was discouraged – after all this was a *research* strategy – and the wider system changes which may have evidence the emergence of new capacities were not included in the monitoring of the programme progress.

As mentioned, these arrangements did change over time, not least because DFID made a major shift in 1997 with adoption of an explicit poverty focus, with subsequent attempts to fit research into a more people focused development paradigm. However, the overall framework for research support was highly linear. This was so both in terms of the relationship between Northern and Southern partners and in terms of the assumptions that new knowledge would automatically find 'target institutions' that would transfer it to 'target beneficiaries'. This was classic *transfer of technology* thinking, and it was

embedded in the project cycle design. The increasing use of participatory methods in adaptive research, despite the best of intentions, proved to be a superficial gesture against the backdrop of an approach that was deeply rooted in linear, hierarchical traditions and patterns of relationships and authority.

Evolution of CPHP interest in innovation systems in India

The CPHP interest in the institutional context of R&D&TP, and subsequently the innovation systems framework, started in 1997. A series of projects had been commissioned by the CPHP to provide technical backstopping to parts of the export horticulture sector. The context of these projects was the efforts of the Indian export development authority (APEDA) to improve fruit quality and develop sea shipment protocols for mangoes. In practice this was being implemented by contracting Indian horticultural and post-harvest scientists to develop technical protocols for farmers associations and export companies. In line with the conventions of the time, CPHP assistance for this process was in the form of a tightly focused technical project developed and implemented by UK scientists. The focus of the projects was a farmers association in the State of Andhra Pradesh, with the UK and Indian scientists working together to develop technical protocols. As this work progressed, it became apparent that constraints to the development of the export horticultural sector would not be solved by a simple technical backstopping approach. After all India has extensive scientific infrastructure and staff.

In fact the true nature of the problem encountered was one of mobilising the different parts of the public sector research system to act in a consorted fashion to deal with quality management issues in an integrated production and post-harvest chain. The UK scientist's attempt to devise a sea shipment technical protocol was not in itself going to address this broader problem. Without a greater degree of articulation between different scientific actors and between scientific actors and export actors, the technical and managerial innovations necessary to create a mango export supply chain were simply not going to emerge. At the same time there was apparently no other mechanism or agency that could help link-up the different part of the public sector research system with farmers associations and private companies. Furthermore, as private organisations moved into the horticultural export sector, they were entering into alliances with other, often private actors as a way of accessing technology. While these developments demonstrated the potential importance of emerging institutional groupings, it was difficult to see how the public sector research system could relate to these developments.

It was at this point that both the farmers association collaborating in the project, and the UK scientists realised that the true nature of the task was as much institutional as it was technological. The author, both as CPHF regional co-ordinator and as a policy researcher, recognised that if these institutional developments were to be resolved, understood and exploited, much greater attention would need to be given to understanding the over all institutional context, its nature and the way it was evolving.³ It was this realisation in late 1997 that led to partnership with NCAP and ultimately to a policy research project exploring and applying the innovation systems concept.

The evolution of the collaborative policy research project with NCAP on innovation systems

The Northern partner first visited NCAP in mid 1997. Although the visit was with reference to another study on commodity outlook, discussions with the Director focused on the issue of public-private sector partners in the horticulture/post-harvest sector. The Director was interested in the area because he felt that the Indian Council for Agricultural Research (ICAR) needed to give much greater thought to its role and relationship with the emerging private sector. On his suggestion a pilot project was developed. (The Northern partner had wanted to immediately launch into a three-year project). The idea of this pilot phase was not only to explore the relevant issues in greater detail, but also to use the project as a device to build wider interest in the topic among the relevant stakeholders from the public and private sectors in India.⁴

The result was that in early 1998, the Northern partner secured funding (from CPHF) for a six-month investigation of emerging public-private sector relationships. In fact the project had both a technical and institutional element, the idea being that continuing with technical research would be a good way of revealing the nature of institutional arrangements and the implications these had for the research process. The broad issues that emerged were discussed in two workshops held in Delhi in June and September 1998. The main thrust of this work pointed to the fact that potentially important partnerships could develop between the public and private sectors, but that this was constrained by the prevailing institutional set-up. This raised questions over the most appropriate institutional grouping, how these new capacities could be developed and sustained, what was the appropriate role of the public sector in

³ These issues are discussed in detail in Hall *et al.* 1998, a & b, and 2002.

⁴ This pilot work involved another Southern partner, Dr Sivamohan from the Administrative Staff College of India, who worked on the project in the private capacity as a consultant.

this evolving institutional context, and what would be the implications for achieving developmental goals such as poverty reduction.¹

The innovation systems perspective

In shaping thinking on these issues, the decision to involve a senior Northern collaborator/advisor in the pilot project was critical.² As a senior science and technology policy specialist and with the benefit of detachment, the advisor recognised that the many of the institutional developments that were starting to become apparent in the India horticulture/post-harvest sector resembled the patterns and concepts, referred to as *innovation systems*, discussed in the context of the developed, industrial economies.

It was at this point that the Northern partner turned to Lundval's (1992) idea of a National System of Innovation (subsequently the ideas that this contains have been referred to as the innovation systems framework). At its simplest this idea contains two elements. Firstly, it asserts that innovation (technical and economic change) takes place through the iterative interaction of both research and non-research actors. Secondly, it acknowledges that these actors are always embedded in a wider political, social, economic and cultural environment and this skews the way interactions between actors lead to different innovation outcomes. In practice this means that the collective effect of interactions of these actors in this wider institutional context represents a capability to innovate. This capability depends on the pattern of relationships linking the different actors, and the relative ability of the system to evolve new patterns of interaction, as needed (institutional learning). The innovation systems framework helps to analyse these relationships and the resource and knowledge flows that they imply.

Having recognised that the innovation systems framework could provide a useful way to understand the institutional environment of the research and development activities of CPHF in India, further work was needed to apply this idea to the study of developing country agriculture – it had previously been used in the context of developing countries and then mainly in the industrial sector. Similar ideas had been suggested by others in the context of the agricultural sector, notably Biggs' 1990 discussion of multiple sources of innovation.

¹ Further details can be found in Hall *et al.* 1998 a & b.

² This advisor was Prof. Norman Clark. He was already well known to the Northern partner, having supervised his PhD. He was previously at the Science Policy Research Unit at the University of Sussex, UK and is currently Director of the Graduate School of Environmental Studies, University of Strathclyde, UK. He continues to collaborate/advise both the Northern and the Southern partner on the innovation systems policy research project.

Proposal and programme development and implementation

The way these ideas took shape relates primarily to the production of two documents recording the findings of this pilot project (Hall *et al.*, 1998 a & b). NCAP and particularly the Director had been involved in the workshops and the discussions associated with the pilot project. However the way this was translated into publications and the subsequent research proposal was mainly a consequence of the interests and perspectives of the Northern partners. As a result the author wrote the research proposal. This was discussed in much detail with NCAP and it was at the stage of these discussions that the key Southern partner, Dr Sulaiman, became involved in this work. There was a large degree of shared interest between NCAP with its policy role within ICAR and the Northern partner and his policy interest with respect to co-ordinating the CPHP in India and his wider professional interest. However, despite the fact that we were espousing an innovation system focus in our proposed policy research, the partnership arrangements governing this North-South collaboration were not broadly different from those discussed in the earlier section. We assumed that working together we would produce a range of policy outputs, which – in a rather linear fashion – we assumed, would be promoted by NCAP (as both collaborator and 'target institution') and that this would stimulate broader behavioural changes in the research system. It was these assumptions that our subsequent more in depth understanding of the innovation systems frameworks has caused us to revisit.

One of the key features of the policy research project was the way in which it was contingent on the wider CPHP portfolio of projects in India for empirical insights into new patterns of partnerships and institutional processes. The way this was approached in practice was to create a two-tier structure of projects. This contained an 'umbrella' policy project dedicated to the conceptual and methodological development of the innovation systems framework. At the same time a cluster of 'technical' projects were developed, which, by virtue of their patterns of partnerships, it was hoped would make useful case studies for the policy project to test and develop its innovation system framework ideas. This process started in October 1999 (two years ago at the time of writing) and produced four projects, two of which were particularly interesting. Again it should be made clear that this design, and to a certain extent the types of project developed for CPHP funding in India, was largely a result of the interests of the Northern partner both in his capacity as a policy researcher and as South Asia regional co-ordinator.

A further point of importance was that at this stage the CPHP (as distinct from its regional co-ordinator), while interested in the institutional analysis that the

policy research project was starting to undertake, had not yet accepted the wider implications of adopting an innovation systems approach. As a consequence, even though two of the South Asia projects turned out to be quite exciting from an institutional perspective, projects were still been conceived and commissioned by CPHP in a conventional fashion. As a result projects continued to be (mainly) led by Northern partners and the framework in which they were designed remained highly linear – research actors ‘collaborated’ to produce outputs that were to be passed to ‘target institutions’ who in turn passed them to ‘target beneficiaries’. And of course implicit in this was a set of assumptions about the way the institutional underpinnings of this process worked – assumptions that both our own field experience and the innovation systems framework told us were flawed.

A critical element of the problem that the CPHP structure presented related to the fact that the policy research project and the technical projects were managed independently. As a result the institutional and process lesson from the policy project had no way of impinging on the direction and outcome of the technical projects. Similarly even as it became apparent that the technical projects needed to concentrate on generating their own process and institutional lessons (both for project management and research finding reasons) there was no way in which this could be accommodated by the linear path dependant project design. The later discussion will illustrate the way the innovation systems framework has been applied to address this issue.

Innovation system ideas in practice⁷

A useful way to explore the innovation systems idea and the question of North South partnerships in this context is to present brief case studies. In the following section, two of the ‘technical’ projects in the CPHP portfolio that were

⁷This discussion does not include a discussion about the use of the innovation system framework at ICRIASAT. In fact the Institute, like ICAR and CPHP, has recognised the need to get to grips with the institutional context its research work. ICRIASAT is now starting to recognise the value of the innovation systems framework and has recently asked the author to undertake an evaluation of one their southern Africa programmes using this approach. (Political reasons prevented the author’s Southern partner Dr Sulaiman collaborating on this study). Just as the CPHP work has raised questions about the conventional relationship between the Northern and Southern partners, the southern Africa evaluation has thrown up issues about the conventional relationship between international agricultural research institutes and national agricultural research organisations. Again this relates to the need to develop broad-based innovation system capacity rather than research capacity in public science alone. And the need to redefine the roles of international agricultural research centres in the context of these innovation systems. (For further details see Hall *et al.* 2001c; Reddy, 2001 and Hall 2001.)

developed specifically to address institutional issue are first present. A third case study is then presented to illustrate the policy project that the author has been involved in.⁸

Case study 1. Strengthening the nodal function of farmers associations in post-harvest innovation systems

This project built earlier CPHF work on horticultural export technical backstopping. It contained an explicit attempt to help strengthen the ability of farmers association to access and co-ordinate appropriate technical assistance from public scientific institutes in India. At the centre of this was a monitoring system design to monitor both the technical and institutional performance of a training and technical assistance programme implemented by the Indian Export Development Authority. The objective was to introduce two elements into the horticultural innovation system. Firstly, an explicit attempt to introduce more system oriented technical backstopping approaches, i.e. more co-ordinated and productive linkages between different scientific actors and between them and other stakeholders in the system. Secondly, to challenge institutional assumptions about service delivery and in this way stimulate evolutionary institutional change. The second element of this project was particularly ambitious as it assumed that all stakeholders would welcome a monitoring system of this type as a consensual management tool. In actual fact it was viewed as deeply threatening to established patterns of professional behaviour and authority.

The project has unfortunately not been able to achieve what it set out to do. There are many case specific reasons for this. Perhaps of interest here is the difficulty of a Northern project leader maintaining the momentum in-country. And similarly, the difficulty of maintaining (achieving) the commitment of stakeholders to implement the type of monitoring system that is clearly needed and to face up to the uncomfortable realities of critical assumptions about institutional roles of key actors. In all fairness to the Southern partners, the Northern partners, in the misguided hope that it would become all too apparent to all concerned, down played the agenda of institutional change. As a result it was difficult from the outset to build a consensus around the concept that technological change was inextricably linked to institutional performance and hence to institutional learning.

⁸These case studies are based on a series of project documents, published papers and project and programme reviews. These sources which also contain additional case studies are as follows: Biggs and Underwood, 2001; Hall *et al.* 2002, 2001 a, b, c & d, 2000 a, b & c, 1998 a & b; Hall and Andrew 1997; Malinset *et al.* 1997; Martet *et al.* 2001; Sulaiman 2001 a & b.

A further problem related to the realisation of the weak poverty focus of the project as a result of the dominance of certain actors. This project has now been halted. It is to be renegotiated in a stronger innovation systems type approach, with more explicit focus on initial stakeholder analysis. The hope is that this will both skew the actor dynamics in the project towards a poverty agenda, as well as more firmly rooting the institutional change agenda among local actors. It is anticipated that the project will then be led by an Indian organisation and that the Northern partner will assume a service delivery role in this context.

Case study 2. NGO led approaches to facilitating the creation of new post-harvest innovation system capacity

This project was led by a large UK based NGO in collaboration with an Indian NGO. Over the last ten years the Indian NGO has developed an approach to technology delivery to the poor. This involves using commercial marketing principles to identify technology demands amongst the poor and then identifying or adapting suitable technology and establishing networks to produce and sell it to the poor. This has been done with great success in the context of small-scale irrigation/water resources technology. What is interesting about the approach is that it fills a niche between the public sector/donor distribution and the activities of the mainstream commercial sector. In doing so it establishes a set of technology producer – retailer – technology user linkage that would probably not have emerged with external assistance, but which will subsequently underpin private sector involvement.

The CPHP project concerned applying this approach to post-harvest technology in the context of small-scale producers of vegetables for the Indian domestic market. The project was speculative in the sense that the approach appeared interesting, but it was not clear how it would be operationalised for a broad technological sector such as post-harvest. Approval of the project was hampered by the reluctance of the CPHP's advisory committee to support a project that was strongly process driven (and where key outputs would be process lessons) without any clear technical constraint focus or technology outputs.

What was interesting in terms of the North-South partnerships was that while the Indian NGO had the practical experience and skills of establishing networks, the UK NGO (in theory at least) had 'research' skills and expertise in specific technical and social science areas related to post-harvest technology. At the outset the Indian NGO had recognised that it had no particular expertise related to post-harvest. The decision was made that the project would therefore be implemented by building a series of relationships with a range of actors

associated with the development and supply of technology and services to the poor. The Indian NGO's other role, in addition to building these relationships, was to identify the particular technology niche using procedures it had developed in the context of water resources technology.

When reviewed, it was found that the Indian NGO had created an innovation system around the development and supply of improved tomato packaging technology – the identified niche technology. This included partnership with scientists from a national research institute who undertook extensive and fairly sophisticated adaptive trials. It included partnership with local grass-roots NGO's who had already established a relationship with farmers. It included partnership with the local agricultural university for information on local crop production systems. It included both public and private sector cardboard box manufactures. And it included traders and markets actors involved in distributing and popularising cardboard boxes as a replacement for wooden crates. The NGO sat at the centre of this web of actors and made explicit efforts to manage the relationships involved.

In all of this the Northern partner was not playing the role that had initially been anticipated and the relationship had not altogether been an easy one. There are many case specific reasons for this. However the generic issues was that where an R&D initiative is going to rely on the establishment of a coalition of different actors in-country, it makes sense to have the in-country partner take the lead in this type of initiative. A related issue in this project was the history of the relationship between the two NGO's. The UK NGO had effectively contracted the Indian NGO to undertake research in previous 'collaborative' projects. The post-harvest project was not presented to CPHF as this type of arrangement, but as the project was implemented it became clear that the relationship between the two NGO's was one of 'donorship' rather than partnership.⁹

In the case of this project the leadership has been shifted by CPHF to the Indian NGO. This has caused protests from the UKNGO. With the Indian NGO leading the project, it can now draw down assistance from its Northern partner as required. In fact it usually does this in the context of reporting progress to the donor in an acceptable format, rather than specific technical support.

⁹ For example, the UKNGO would not disclose the budget to the Indian NGO. Another example related to ownership of the project results. The UKNGO requested the Indian NGO to enter into an agreement whereby the results would be only be promoted by the UKNGO.

Case study 3. Policy paper, policy networks and the wider institutional context of partnerships

The third case study concerns the partnership between the Northern partner and Dr Sulaiman of NCAP, and the policy research project on innovation systems that they collaborate on. As discussed elsewhere the project held interests for both partners. Since 1999 both partners have undertaken a series of case studies, written papers together and presented these at national and international meetings and conferences. The partnership worked well and was, and continues to be intellectually stimulating and a significant number of policy documents have been produced. But what was the policy impact of this research and therefore the value of this North-South partnership? The answer is that, initially at least, the impact is probably quite limited. There are two reasons for saying this and these actually related to what the research has revealed about the institutional context of India and the implications of using an innovation systems approach.

Firstly, the Indian public sector agricultural research system is strongly wedded to the linear paradigm of R&D&TP planning, execution and evaluation. This paradigm permeates the whole organisational culture of ICAR and informs the majority of the 'agricultural technology for development' discourse in the country. The exploration of the innovations framework has highlighted the need to introduce institutional experimentation and learning; the need to strengthen genuine partners with private and non-research actors and the need to build coalitions or task networks around common themes and interest.

These are certainly useful findings for policy and practice. However as policy researchers the Northern and Southern partners had failed to heed the advice that they were promoting, i.e. the need to develop their own coalition around the promotion of the innovation systems framework as an alternative approach to R&D&TP in India.¹⁰ Without the creation of such a network of support and advocacy a policy research project stands little chance of creating a new consensus that can challenge the normative organisational culture of a large public agency such as ICAR. The project is now addressing this need by networking with like-minded policy researchers and practitioners. To this end it is employing network building devices such as: special addition journal publications, commissioning reviews of CPHP by Southern rather than Northern consultants; working with Southern private consulting and advisory services; and using commissioned studies as a way of building ownership and consensus in the research community.

¹⁰The project and the author are grateful to Dr Stephen Biggs for pointing this out to us during a programme review.

Of course the way of actually succeeding in building these coalitions will always to some extent remain an empirical question. The research team recognises that it will have to be opportunistic and entrepreneurial in pursuing this coalition building agenda. In more general terms, however, this suggests that while the nature of the North-South partnership is an important consideration, perhaps more critical is the way this partnership contributes to the wider nationally located innovation system in which these collaborative efforts ultimately seek to have operational focus. North-South partnership therefore emerges as a capacity building effort in the systems sense.

The adoption by CPHP of the innovation systems framework for North-South research partnership

As can be seen from the above, by early 2001 some fairly fundamental implications were starting to emerge in the context of the way the CPHP commissions and implements projects. Four issues stand out.

Firstly, the success of research and development projects is clearly very closely related to assembling the appropriate institutional grouping or coalition around a particular problem area. This institutional grouping is predominately going to be made up of Southern partners and assumptions about the institutional roles of actors are going to have to be made explicit from the start and reassessed as the project proceeds. These actors are likely to include scientific ones, but not exclusively so and not necessarily as the leading actor. Similarly roles will evolve as projects evolve.

This raises the second point, namely, which *is* the most appropriate institutional grouping? Clearly this is very often an empirical question that cannot realistically be answered at the outset of a project. The implication of this is that projects have to become more process, action research type projects. Our evaluation of earlier CPHP projects suggested that the programme procedures and reporting structures were creating much path dependency in its projects, often persisting with partners and technology trajectories, even when it was apparent that changes in direction were needed.¹¹ The related implication of a process approach is that the process lessons associated with technological

¹¹ Our earlier experiences with the mango project are an example of this. The technically focused work developing sea shipment protocols would have continued purely as a technical issue, despite widespread recognition that this was not relevant. The initial project was only able to take a change of direction and examined institutional issues because the lead scientist resigned from his position and was no longer able to lead the work. Similarly, later concerns about the poverty focus of the project could only impinge on the direction of the project because of a subsequent hiatus caused by the loss of the project leader through a redundancy scheme.

success in projects are equally valid project outputs and are probably complementary innovations to the new technical knowledge that projects produce. The NGO case study is a very clear example of this.

Thirdly, in efforts where a poverty focus is paramount, stakeholder analysis is needed to ensure that this agenda is promoted within the coalition. The relationship of the coalition with the wider institutional context and the effects this has on patterns of relationship and the way agendas and priorities are identified and promoted needs to be made explicit from the start of the project.

The fourth point relates to the way projects are monitored. Monitoring direct poverty impact – as, for example, DFID requests – makes little sense (from a project management perspective) given the limited time-frame problem, the attribution problem and most importantly of all the complex systems phenomena (livelihoods are a complex systems in which future outcomes of current initiatives are unknown and unknowable). The conceptual message from the innovation systems framework is that rather than worrying about monitoring the inputs and outputs of research, it is more useful to monitor process change, particularly the way relationships between actors are changing and leading to improved innovation performance. Again stakeholder analysis is likely to be important in ensuring that innovation is skewed in favour of the poor. Knowledge about patterns of power and dynamics in coalitions and how this is changing in favour of desired outcomes is key indicator of new innovation capacities. This suggests much greater emphasis will be placed on judging capacity-building outcomes of projects. But not capacity building in the conventional sense of building up stocks of research infrastructure and trained scientists. Rather, capacity building in the sense of the collective capacity of networks or systems of actors to innovate.

In order to consolidate these findings in the programme, a review was commissioned in August 2001 of the CPHP's activities across all its regional programmes – South Asia, West Africa, East Africa and Southern Africa. Critically, Dr Stephen Biggs was commissioned to undertake the review. Dr Biggs has been advocating the use of the innovation systems type principles for the last 20 years or so, and therefore his perspective and recommendations resonated strongly with the findings emerging from CPHP's South Asia activities. The review highlighted the type of issues detailed above and recommended that the innovation systems framework should be used as the guiding principle across the whole of the CPHP's research programme. The CPHP programme manager has accepted this recommendation and used it to underpin the technical proposal that he presents to DFID explaining how he will implement the CPHP for the next three years. This shift in approach has included a deliberate, stated rejection of the transfer of technology model. This means that

the practice of the CPHP and even the language and framework in which it is discussed has altered. Target institutions and beneficiaries are now information groups and technology users. This is not just window dressing, but an explicit attempt to foreground and test the institutional assumptions concerning the roles actors play in innovation systems. This has been a critical development.

In practical terms this means that starting in April 2002 all new initiatives from the CPHP will be implemented in the innovation systems framework. There will still be old style projects that have already been started and that will have run their course. A key change will be that instead of releasing a call for research proposals to which in the past the UK research community predominately responds, the programme's regional co-ordinators will be responsible for developing coalitions of actors around a limited number of technical or policy research themes. This will then form the basis for the negotiation of action research projects. This does not exclude Northern partners. Rather it recognises that coalitions need to be established in-country around a particular theme. The membership of the coalition and the role (or roles) of the actors will be determined by the nature of the theme and the wider (perhaps national) institutional context in which the coalition is being developed.

North-South partnership in the wider institutional context

Returning to the North-South partnership issue what are the implications of CPHP's adoption of an innovation systems approach? It does not mean that a decision has been made to fund only Southern partners. Instead it has decided to use the coalition – and the innovation systems principles that underpin this – as a way of determining the usefulness of particular partners (be they Northern or Southern) and in particular determining the role of those partners in the context of a theme based coalition. The critical point will be that institutional roles of all partners will be made explicit at the beginning of the project and, through an appropriate monitoring procedure, partners will be accountable to those roles. This will include greater attention to the pattern of relationship between the Northern and Southern partners, an explicit attempt to avoid the 'donorship' relationship discussed earlier, and an explicit attempt to make Northern partners accountable to Southern coalitions. This is going to require institutional learning and behavioural changes by Northern and Southern research partners and by the CPHP itself.

As mentioned, although the driving force of these changes does not primarily concern a redistribution of financial resources, in practice it is anticipated that a greater proportion of resources will flow to Southern partners. This reflects the

recognition that innovation systems need to be rooted in the institutional environment of a national context. It also reflects the change in emphasis from developing new technologies to developing new capacities to innovate. This shift in orientation is consistent with the emerging trend in development assistance more generally, where managed networks and inter-agency links and partnerships are increasingly important in meeting wider goals of policy change and institutional reform. This in turn has given emphasis to process, with the attendant need to focus on understanding and monitoring institutional interests and relationships, and to inter-agency communication and consensus building. The importance of relationships reflects the fact that interventions are now less concerned with creating deliverable products, and more concerned with introducing behavioural changes which have to be sustained in the longer term (Mosse 2001). The implication of this is that North-South research partnerships need to be conceived and executed in the framework of institutional change and capacity building. These wider sets of relationships and the need to engage, contribute to and influence them needs to form the framework for further discussion of North-South partnerships in the field of science and technology.

Conclusion

In this paper the development and use of the innovation systems framework has been used to illustrate both an example of, and an approach to North-South research partnerships. The main conclusion is that the nature of partnerships needs to be made explicit in agricultural R&D&TP, as the nature of the institutional context largely determines the outcomes of such efforts. This not only has implications for North-South partnerships, but also for the wider issue of formulating appropriate policies to promote science and technology-led development. Initiatives need to be more firmly embedded national stakeholder networks, and technical imperatives need to be supplemented by efforts to build new forms of multi-institutional capacity. North-South partnership should be supportive of this more broadly conceived notion of capacity building.

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