

STRENGTHENING POVERTY REDUCTION PROGRAMMES USING AN ACTOR-ORIENTED APPROACH: EXAMPLES FROM NATURAL RESOURCES INNOVATION SYSTEMS

Stephen Biggs and Harriet Matsuert

Abstract

This paper explores the use of actor-oriented approaches in natural resource-based development. It begins by reviewing the need to bring an analysis of actor linkages, coalitions and information flows higher on the agenda in planning, implementation, monitoring and evaluation. Various tools which could assist in doing this are introduced and their use is illustrated in case studies of natural resource-based research and development (R&D) projects in Nepal and Bangladesh.

Research findings

- *Use of actor-oriented tools can change perceptions of development actors, encouraging them to engage with the social and political context of their activities in a productive way.*
- *Actor-oriented tools provide practical ways to monitor, document, and assess and thus legitimise crucial institutional strengthening activities.*

Policy implications

- *Actor linkage analysis and coalition building for effective and sustainable development should be legitimised and rewarded.*
- *Development interventions should include actor-oriented tools in development planning, implementation, monitoring and evaluation.*
- *Development agencies should employ and integrate professional staff with actor-oriented social science skills (e.g. applied anthropologists, evaluation specialists, applied ethnographers) into their mainstream activities.*

Contact Details

Stephen Biggs can be contacted at the International Centre for Integrated Mountain Development (ICIMOD), GPO Box 3226, Kathmandu, NEPAL. *Email:* s.biggs@wlink.com.np

Harriet Matsuert can be contacted at 188 Gulshan Avenue, Dhaka, BANGLADESH.
Email: matsaert@citech-bd.com

Acknowledgements

We would like to thank Don Messerschmidt, Scott Justice, Devendra Gauchan and Rob Tripp for helpful comments on an earlier draft of this paper.

The Agricultural Research and Extension Network is sponsored by the UK Department for International Development (DFID). The opinions expressed in this paper do not necessarily reflect those of DFID. We are happy for this material to be reproduced on a not-for-profit basis. The Network Coordinator would appreciate receiving details of any use of this material in training, research or programme design, implementation or evaluation.



Network Coordinator: Robert Tripp Administrative Editor: Alana Coyle

CONTENTS

	Page
Abstract	i
Contact details	i
Acknowledgements	i
Acronyms	iv
1 INTRODUCTION	1
An actor-oriented approach	
Some actor-oriented tools	
The actor linkage map	
Actor linkage matrix (ALM)	
Actor determinants diagram	
Actor time lines	
Actor learning and response analysis	
2 CASE STUDIES	4
Pre-project activity in a crop post-harvest coalition project in Bangladesh	
Restructuring the national agricultural research system in Nepal	
Changing power tiller innovation systems in Nepal	
3 DISCUSSION AND REFLECTIONS	11
Political issues in using actor-oriented tools	
Importance of events and key locations	
Importance of individual actors	
Actor linkage maps versus actor linkage matrices	
A role for quantification?	
Cultural dimensions of transaction costs	
Keep it simple	
4 CONCLUSIONS	14
REFERENCES	14
ENDNOTES	16
Figures and tables	
Figure 1 Illustrative actor linkage map	2
Figure 2 Map showing key actors in a Bangladesh chilli innovation system	5
Figure 3 Example of an actor derminants diagram	6
Figure 4 Suggested framework for NARC's PTD and multiple linkages programme	8
Figure 5 Example of an actor linkage map for NARC	9
Figure 6 Time line of major phases in the spread of power tillers in Nepal	10
Table 1 Illustration of an actor linkage matrix	2
Table 2 Actor linkage matrix used to monitor partnership building	7

Acronyms

ALM	Actor Linkage Matrix
AREP	Agricultural Research and Extension Project
CPHP	Crop Post-Harvest Research Programme
DFID	Department for International Development (UK)
ISNAR	International Service for National Agricultural Research
MOU	Memorandum of Understanding
NR	Natural Resources
NARC	Nepal Agricultural Research Council
NGO	Non-governmental Organisation
OR	Outreach
PTD	Participatory Technology Development
RCT	Resource Conservation Technology
R&D	Research and Development
S&T	Science and Technology

STRENGTHENING POVERTY REDUCTION PROGRAMMES USING AN ACTOR-ORIENTED APPROACH: EXAMPLES FROM NATURAL RESOURCES INNOVATION SYSTEMS

1 INTRODUCTION

This paper focuses on development interventions in natural resources-based innovation systems. We present a number of tools which we have found useful in allowing us to focus more closely on the actor linkages found in innovation systems. The paper suggests that these social science and more qualitative tools should be seen as parallel and complementary to the analytical approaches of natural resources research (experiments, surveys, etc.) and the tools of quantitative economists (rates of return studies, resource allocation priority setting exercises).¹ We start by introducing these tools and go on to illustrate their use through a number of case studies from recent work we have been involved in. Finally we reflect on our experiences and make suggestions for others who are interested in developing actor-oriented tools to suit the context of their own work.

By innovation system we mean the system of all major social actors affecting the revealing, acknowledgment, generation and diffusion of technical and institutional knowledge over time (see Hall et al., 2001; Nelson and Winter, 1977; Freeman, 1988; Ekboir, 2002; Clark et al., 2003). We are working from the premise that a strong, effective and sustainable innovation system is one where institutions² facilitate flows of information and good partnership coalitions between key actors over time. Powerful support for this view can be found in Douthwaite's recent analysis of a selection of innovation systems (ranging from crop varietal developments to computer software innovations). One of his findings was that successful and sustainable innovations are invariably those developed in a system that can be characterised as a 'bazaar approach'. This is where users and manufacturers of technologies are always interactive with 'researchers' and fully involved as equal partners, especially in adaptive research (Douthwaite, 2002).³

While most of us acknowledge the importance of linkages between actors, coalitions, alliances and flows of information to successful innovation and to the development of sustainable innovation systems, these aspects are often not addressed systematically and explicitly in the management of natural resource (NR)-based development activities. All too often this results in the development of technologies which sit in research stations, replication of effort, waste of resources, unproductive rivalry between different actors, etc.

The need to address actor linkages and coalitions is becoming increasingly important for NR development actors today. Research funders and governments are actively encouraging new, pluralistic models of research and development (R&D) and extension which bring together actors in the private, public and civil society sectors and reduce transaction costs. (Byerlee, 1998; Kidd, 2002). Alongside this there is no lack of documented evidence of the difficulties and problems encountered by those who try to go forward in forming new partnerships (International Service for National Agricultural Research (ISNAR), 2001).

Despite the need to look more closely at these aspects of NR development activities, there is a dearth of practical and user-friendly techniques available to project managers, which address these institutional dimensions of innovation systems. Mainstream planning, implementation, monitoring and evaluation tools such as the log framework tend to emphasise activities and products, which do not relate to these actor linkage and process issues.⁴

An actor-oriented approach

This approach is concerned principally with mapping relationships and flows of information to provide a basis for reflection and action. These ideas and tools are not new. Their parents are many and include anthropological and social network research techniques (see Long and Long, 1992; Long and Van der Ploeg, 1989; Lewis, 1998; Davies, 2002); stakeholder analysis (Ramirez, 1999; Grimble and Wellard, 1997; ODA, 1995); economic input and output models (Falcon, 1967); agricultural information knowledge systems (Roling and Jiggins, 1998; and Berdegue and Escobar, 2002); processes monitoring and documentation (Mosse et al., 1998); graphic theoretical techniques (Temel et al., 2003); communications systems (Mundy, 2003); and the analysis of the behaviour of disciplines in agricultural sciences (Raina, 2002).⁵ However the systematic application of these techniques by development actors within NR innovation systems is still not common.⁶

In our recent work we have been using and developing these tools in a range of NR contexts. We have found them to be a very useful complement to other planning tools such as formal surveys and experiments, log frames, conventional monitoring and

evaluation mechanisms, and more quantitative types of research priority setting studies.

Some actor-oriented tools

The first stage in all these exercises is to identify the key actors who bring about or prevent change in an innovation system, i.e. identification of the actors who are the actual drivers or preventers of change. The breadth of the analysis can vary. One can look at a national system, a particular region, or at a particular group of actors, e.g. farmers. One can disaggregate more or less depending on the breadth of the study. A national analysis might put researchers in one box. In a separate analysis one might want to set up an actor map or matrix just to look at the interactions between different types of researchers in the public and private sectors. On other occasions one might want to separate actors into those who are in the public, civil and private sectors. Increasingly actor analysis is being used to analyse the role of aid donors, international research organisations, international non-governmental organisations (NGOs), etc. in the same framework as looking at actors at the village and national levels. The framework can be used in an analysis of gender relationships. It should be pointed out that the emphasis is on identifying specific social groups or actors in a specific location at a given point in time. Consequently the actor approach differs from some economic frameworks where ‘sectors’ of the economy are defined by what is produced: the agricultural sector, the manufacturing sector, etc. In actor analysis it is the people who make decisions which defines the groups. One would not then have a group called ‘economic forces’, or a category called ‘research’. Research does not just happen; it is people who do research, so the category would be ‘researchers’.

The actor linkage map

The actor linkage map is a useful starting point for discussing relationships and flows of information in an innovation system. Key actors are shown on a map with arrows between them indicating flows of information. In actor linkage analysis there is always

an arrow going in each direction. Single two-headed arrows are never used, as one of the main points of the mapping is to examine power relationships in the control of flows of information in different directions. The intensity of these flows can be illustrated by the width of the arrows. In Figure 1 the thick arrow going from farmers to researchers illustrates a strong flow of information. The fairly weak flow of information from researchers to farmers is indicated by a thinner arrow. It should be noted that these maps need to represent actual flows of information, etc. rather than official organisational charts. The map gives rise to discussions of formal and informal mechanisms used to transmit and control information. It also highlights the issue of which actors and linkages are going to be in the analysis. In the past many actor linkage maps used in agricultural research and extension discussions have restricted themselves to public sector actors (e.g. government research institutions, government extension organisations and ‘beneficiaries’ (e.g. ‘passive’ farmers). In addition few maps included such actors as ‘funders of research’ or an analysis of how these funding actors interacted with other actors, often determining research agendas and research processes.⁷

The actor linkage maps are particularly useful when focusing on one actor and his or her linkages with other groups.

As the number of actors increases, however, the map can become too complex. At this point it may be useful to work with maps of part of the system or move to an actor linkage matrix.

Actor linkage matrix (ALM)

The matrix is similar to a map in that it identifies all the actors and shows the links between major actors in an innovation system. In the matrix this is represented by listing actors along the vertical and horizontal axes. The cells in the matrix represent flows of information from the actors in the rows to actors in the columns.⁸ (See Table 1 and example in the Bangladesh case study).

In Table 1 cell 1B refers to information flows from researchers to farmers. In Figure 1 this was arrow 1. Cell 3C refers to information flows between manufacturers and other manufacturers, illustrated in the actor linkage map by arrow number 2. In the matrix all cells can be identified by their coordinates (numbers for rows and letters for columns).

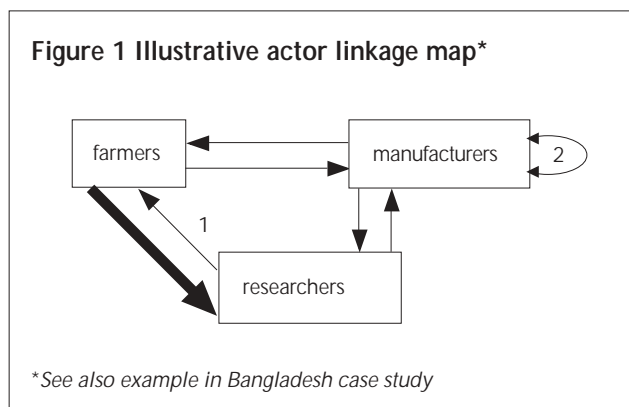


Table 1 Illustration of an actor linkage matrix (ALM)

Actors	A Researchers	B Farmers	C Manufacturers
1 Researchers		1	
2 Farmers			
3 Manufacturers			2

This tool does not lend itself as easily as the map to group work. However it has a number of advantages:

- It can deal with more complex situations and more actors (maps can get very complex and web-like, as more and more arrows are added).
- It has a cell for every possible linkage, and so encourages one to explore all possibilities, to think creatively and innovate! It helps to keep a 'holistic' perspective on which key actors really do determine what happens in a specific innovation system. This does not mean that all actors and linkages have to be looked at all the time. Quite the contrary, as it forces a realisation that only certain linkages can be analysed and worked on at any one time.
- It is a useful tool in helping to pinpoint particularly significant links, e.g. strong links, coalition groups, weak links or opportunities. This makes it more useful than the map for planning, implementation, monitoring and evaluating change.
- It enables users to quantify the strength of linkages using symbols in each cell. e.g. plusses and minuses, or letters such as s (strong), m (medium), w (weak), dn (don't know).
- It enables users to condense and store a lot of information about linkages in the spreadsheet ALM (each cell reference can be linked to a text). Consequently it is a useful tool for documenting a given situation or the outcomes of an event.

The actor linkage matrix is best used with a small group, with people familiar with the technique, or after a discussion to summarise findings that are then circulated. For those familiar with the technique, as is the case of an ongoing research project in Bangladesh the team uses for group discussions a 'matrix board', which hangs on the wall as an alternative to a printout from a computer spread sheet. Here linkages are represented by tokens placed on small hooks.

Actor determinants diagram

This tool, an example of which can be seen in the Bangladesh case study, is similar to the Participatory Rural Appraisal (PRA) problem tree. It is intended as a group discussion (or individual thinking) tool to analyse the nature of a particular linkage.

The starting point is a cell of the actor linkage matrix or a linkage on the map. Normally this would be one that is particularly significant (and might need to be strengthened, weakened or learnt from). The diagram maps weakening and strengthening forces on the linkage and helps a group to identify possible areas of intervention.

This tool can be used in a brainstorming exercise and obviously some 'areas for intervention' will be more possible to implement than others. However, this is one of the important reasons for using the tool. It helps open up a discussion about the feasibility of different actions within the current social and political context. It is a useful tool for building an action plan from the analysis of a particular situation. For this reason it is

most usefully carried out with the key actors who would be involved in any future 'implementation' of suggested actions.

Actor time lines

Coalitions, relationships and narratives of change processes change over time. Getting a group of key actors to construct an actor time line of key past events for a particular innovation system can build a more comprehensive understanding of past change processes and a better understanding of the current situation (see example in Nepal power tiller case study).

An actor time line is a listing of key events in the evolution of an innovation system. The events are 'actor' events. Which actor made key important decisions at what time in the past? As in other parts of actor analysis the emphasis is on human actions. For example, the planning commission abolished restrictions on the imports of two-wheeled tractors. This is different from saying import restrictions were abolished, or structural adjustment policies were implemented. Wherever possible one has to be as specific as possible regarding who took what decisions, when and where. This helps to take discussions out of the realm of generalities into the specifics of understanding the actual causal processes in a particular innovation system.

It also raises awareness in the group of the different perceptions amongst people of what caused things to happen in the past. It is sometimes difficult to get people who have strong views about past events (especially as regards what caused what to happen) to see those events in a different way. Even when someone has been 'convinced' that there are different and legitimate alternative narratives about past events, one can still find 'old' views jumping out unexpectedly and completely undermining an agreed way forward for a coalition. The group's construction of actor time lines is designed to help address this problem. When projects and development activities have become 'path dependent' it is sometimes because old uncontested narratives about past events have been used to maintain a 'business as usual' control over decision-making. Helping people to drop old ways of thinking and see things in new ways is one of the major challenges that the actor approach takes on.

Again we recognise that this is not a particularly new idea. We can all think of occasions when we have seen time lines in a publication or a list of key events in the history of (or a plan for) a project or a programme.⁹ However, the way we suggest actor time lines are used here is more as a learning and reflection tool, a way to establish new common ground in a coalition of partners, and as a tool to guide future action. The time line can either be given as a list of events, with dates alongside, or as a figure with a sequenced bar chart of actor events over time. The figure helps to reinforce the notion of time, sequencing and the path of causation of past events. See Figure 6 in the Nepal power tiller case study for an example of a time line.

Actor learning and response analysis

The last set of tools concerns learning and response analysis on the part of coalition partners. We do not have a specific tool as such. What we have found, though, in the projects we have been working on is that explicit attention needs to be given to ways in which partners can systematically collect information from different sources, analyse it and draw up local action plans as they go along. The existence of papers documenting this analysis and the planned/actual outcomes can be used to monitor the innovative behaviour of partners in the coalition. In principle in all projects information can come from three main sources:

- First, from planned activities, which may be planned experiments, development interventions, surveys or meetings. Often in conventional projects the information from surveys, experiments and meetings is not acted on locally. This is especially the case when academic publications, and 'project requirements' are the primary reasons for the planned data collection activities.
- The second source of information is from 'unexpected sources' and is revealed in the process of collecting planned information or conducting other planned activities. This kind of information is always coming up in projects. For example, in conducting a survey it is found that there is another project in the same region doing similar work.
- The third source of information is from 'unexpected changes' in the context of the project.

We have found that explicit attention to the ways information from these three sources is analysed and used to draw up short-term action plans has become a major component in the actor-oriented approach. In the Bangladesh case study the actor linkage matrix is used to formulate quarterly plans of action to address institutional linkage capacity-building issues. In the Nepal Agricultural Research Council case study the six-monthly agreed plan of action against 'mid-term review' indicators served a similar purpose. In the power tiller case study, the six-monthly Learning and Response tables provided a similar framework. What is significant is that in all cases it was the partners themselves who jointly agreed what they would do over the succeeding months. The onus was on self-learning and appropriate actions on the part of the group itself, rather than making 'recommendations' to other actors on what they should do.

2 CASE STUDIES

In this section we describe various contexts in which we have used and are using actor-oriented tools.¹⁰

Pre-project activity in a crop post-harvest coalition project in Bangladesh

The islands formed by siltation in the river deltas of Bangladesh are known as *chars*, and the people who live on them are amongst the most vulnerable in

Bangladesh. In Jamalpur, the district in which this research is focused, 80% of *char*-based households are estimated to be in the 'extremely poor' category. Because the islands are often temporary islands in the shifting river bed, they have little infrastructure (i.e. they fall in the category which is 40% below the national income poverty line). Most families are forced by erosion to move residence several times in their lives, as well as frequently migrating to the mainland in times of flood.

Char-based livelihoods are very insecure, but the silt deposited annually during the flood period creates highly fertile pockets of land. When the floods recede, *char* dwellers farm their land intensively and market the produce to the mainland. The Jamalpur *chars* are particularly well known for their high-quality chilli, vegetable production and livestock. Land is more readily available and the poorest households have access to more land for cultivation and grazing on the *chars* than their counterparts on the mainland.

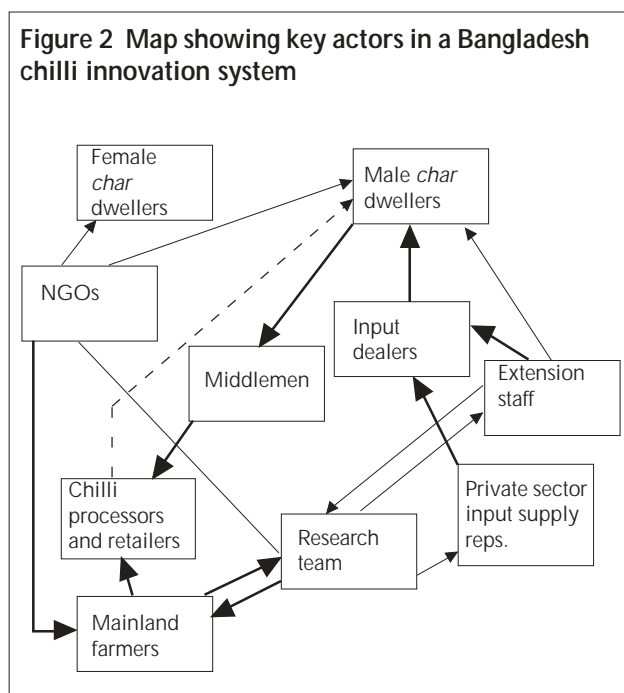
While many *char* dwellers believe natural resource-based production potential is their key relative advantage over mainlanders, they are relatively disadvantaged in their access to sources of information and markets. Because they are often impermanent, *chars* tend to have little infrastructure (roads, electricity and government offices are rare); transport can present a problem (dangerous boat crossings in the rainy season, long walks through sand in the dry season); and most development actors are reluctant to visit the area. So while potential for developing *char*-based production exists, weak linkages with key external actors (extension, research, NGOs, private sector, etc.) prevent *char* dwellers from participating in innovation systems which would allow them to develop new technologies and market opportunities.

The crop post-harvest research programme (CPHP) funded by the UK Department for International Development (DFID) has recently been focusing on strengthening sustainable innovation systems and on the importance of partnerships and coalitions in this work (Hall et al., 2001; Biggs and Underwood, 2001). In the Jamalpur *chars*, the CPHP has funded a research project to examine and strengthen *char*-based innovation systems for two key enterprises: chilli and livestock. The research asks: What is the status of the *char*-based innovation systems? What linkages are made with other key actors at national and international levels? And what opportunities exist to strengthen *char*-based innovation systems through building linkages and coalitions?

The study is being carried out by a research coalition comprising a local NGO (Development Wheel), a national business advisory services centre (BASC) who have an interest in building up a farmers' business association, an anthropologist with experience of knowledge systems in the *chars*, and an expatriate anthropologist/agricultural engineer with experience of developing and using actor-oriented tools.

This core research team is using actor maps and matrices with other key actors in chilli and livestock innovation systems to map out the current reality, identifying strengths, opportunities and weak linkages. Through working together with other key actors the project team expects to build coalitions to enhance the focus and sustained capacity of local innovation systems. The project team does not see itself outside of the process, and uses actor maps and matrices to monitor its own relationships and successes (and failures) in building partnerships with other key actors throughout the life of the project.

In Figure 2 arrows refer to flows of goods and knowledge. The map shows that the strongest links are through the *char* dwellers and the mainland actors are through the private sector. Key information from private sector companies and government extension services is passed on to *char* dwellers by local input dealers. Local middlemen play the key role in providing market access. However national-level processors and retailers are making efforts to develop direct links with 'contract farmers' (shown by dashed line).



The research team has found actor linkage maps easier to use in meetings with potential coalition partners than the matrix which is initially too complex for people to grasp. However, for our internal teamwork and compiling the information we are collecting on innovation systems we have found the actor linkage matrix very useful. Team members have observed that the ALM makes things visible and helps them to be aware of gaps in their knowledge and identify linkages they have not considered.

The team has experimented with different types of matrix, beginning with a simple quantification, then

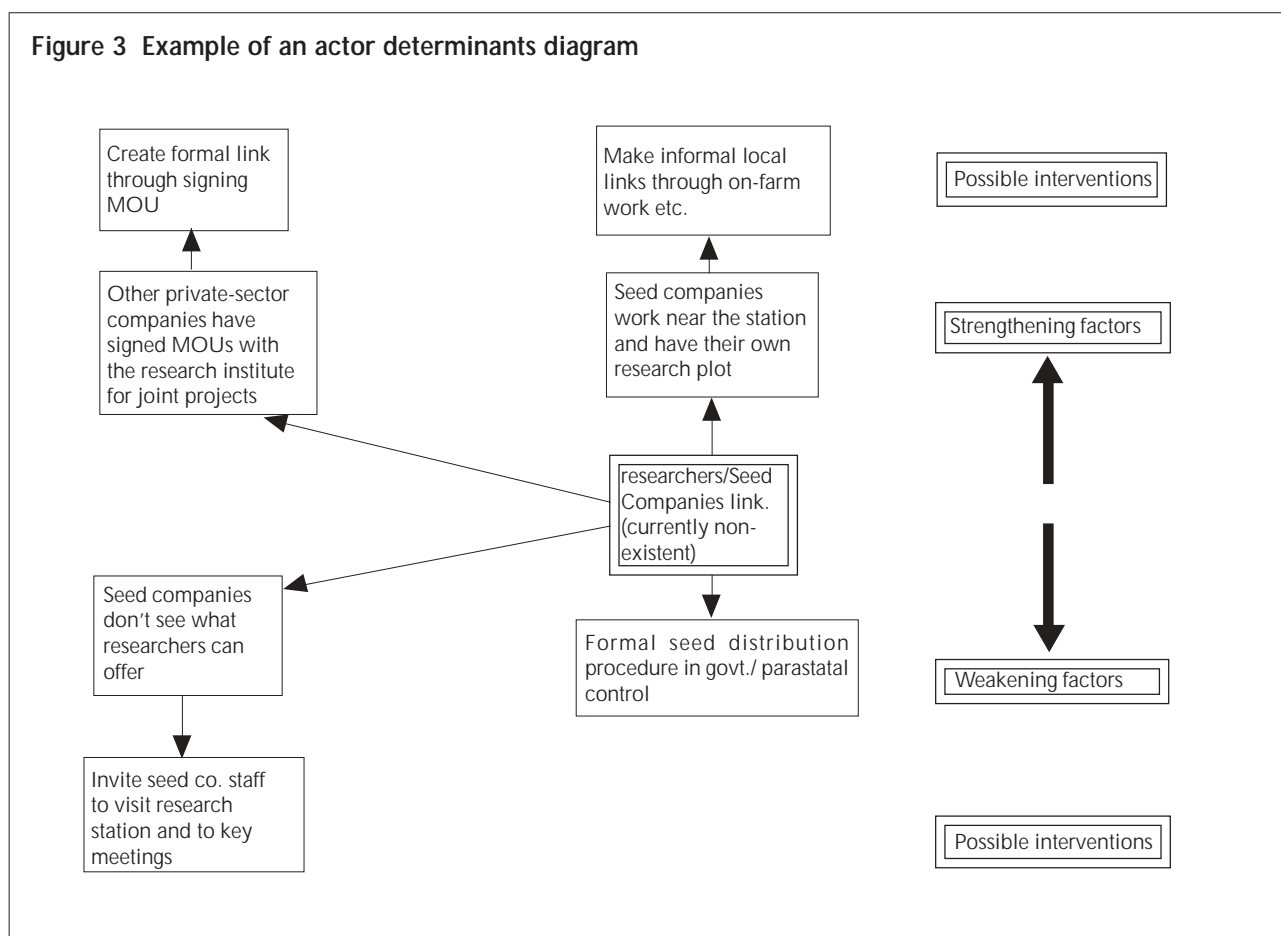
developing a more complex system of quantifying linkages and moving towards a more useful 'qualitative' approach where key linkages are highlighted and described in the attached text. Current uses of the matrix include:

- Monitoring the team's progress in building relationships with other key actors. A matrix is drawn up quarterly, highlighting useful linkages made, and pinpointing linkages we want to develop further in the next quarter.
- Illustrating the expected impact (on building linkages) of a forthcoming workshop.
- Documenting changes in significant linkages and coalitions observed in the innovation system through case study monitoring.

The research is ongoing but to date the use of actor-oriented tools has resulted in a number of important outcomes. Using the tools with research and extension staff has helped discussion reach beyond the formal structures – the organograms of formal relationships and the way things 'should happen' – to the reality of what is actually going on. For example while officially the Bangladesh Agricultural Development Board bulks chilli seed and provides it to farmers, a time line revealed that the uncomfortable reality was that although the 'release and distribution' of seeds by the Board was planned to have happened during the last ten years, it still has not taken place. In the meantime the regular and effective introduction of new seed varieties is being carried out by a national seed company (which currently has no links with the chilli research institute). Using the actor tools has encouraged the chilli researchers to confront the reality of the situation and consider its implications. Should they, and how can they form linkages with this dynamic private sector actor (see Determinants diagram, Figure 3)?

By using the tools to discuss the current status of innovation systems, we can see how they help to reveal and legitimise previously unacknowledged but vital activities by individuals. For example, in the above-mentioned discussion at the chilli research institute, the director told us that they had no links with the private sector, farmers or NGOs. However one of his junior scientists reminded him that he had recently, on his own initiative, begun to work with farmers on the *chars* and had already formed links with a local NGO there, inviting both members of the organisation and farmers to visit the research station. When this activity was marked on the linkage map it emphasised how important the previously unacknowledged work of this scientist was in bridging the divide between the research institute and other actors.

There has been considerable interest in actor-oriented tools from research and extension staff, to which the team has responded by providing briefings on the tools and 'learning by action'. They expect in this way to provide research and extension managers with the means, once they have recognised the need to focus more on building linkages, partnerships and



coalitions, to draw up action plans and also monitor their own progress in this area.

The matrix has helped the research team to analyse its own relationships with project partners, for instance when monitoring their activities in the first quarter. A matrix was used in this process to show the linkages made with key actors, highlighting the fact that most linkages had been between the project team and a single actor. However, to make a sustainable impact linkages had to be expanded to include other key actors in the system. The fact that the team was one of the actors being analysed helped to achieve this in a practical way. The matrix in Table 2, shows how a meeting was planned which would build relationships not only between the project and key actors but also between other actors who are rarely engaged.

It should be said that using these tools is not without hazard. On one occasion the research team was highly criticised by agricultural extension staff when they presented an actor linkage matrix indicating that the extension field staff never visited the research area. Since the extension service takes great pride in working in every area of the country, contradicting this essential part of their identity was unwise and unproductive. The team later became aware that the farmers' group they were working with was keen to represent its

members as isolated and without any services from the government, as a means of increasing their chances of receiving inputs from the researchers. The reality lies somewhere between the two. Since the difficult meeting with the extension team, researchers have noticed that the extension 'block supervisor' now makes regular visits to the focus *chars*. To some extent then in this case the project has helped to bring about a change in the culture of the local extension staff. Regular actor-oriented monitoring would acknowledge and reward the supervisor for strengthening these linkages, and also note the mechanisms being used which are within the current budgets and reward systems of the public sector extension service.

David Lewis (1998) and Brigitta Bode (2002) have recorded similar experiences in Bangladesh of revealing information that contradicts the image projected by a government service. Lewis describes how his involvement as an 'outside' process monitor in a research project came to a premature end when the organisations he was partnering began to find the information he was uncovering about them uncomfortable. In the actor approach we are suggesting here there is no 'outsider' process monitoring. All actors in the coalition (including the research team) are on the 'inside'.¹¹

Table 2 Actor linkage matrix used to monitor partnership building

CHILLI/SOJ	A	B	C	F	H	I	K	L	M	N	P	Q	R	S	U
	Male char dwellers	Female char dwellers	Local leaders	Local middlemen	Dealers	Local government staff	Bank staff	Local NGO staff	National government staff	Researchers	National middlemen	Chilli processors and retailers	Input suppliers	Media	Project team
1. Male char dwellers	d	d				a	a	a		a					11
2. Female char dwellers	d	d				a	a	a		a					11
3. Local leaders															c
6. Local middlemen															13
8. Dealers															14
9. Local government staff	a	a								a					3
11. Bank staff	a	a								a					3
12. Local NGO staff	a	a													2
13. National government staff															4
14. Researchers	a	a				a	a	a	a	a					1
16. National middlemen															5
18. Chilli processors and retailers															10
19. Input suppliers															8
20. Media															6
21. Project team	11a	11a	c	13	14	3a	3a	2ab	4a	1ab	5	10	8	6	

linkages made by the team this quarter
 linkages to be developed through activities planned next quarter

Restructuring the national agricultural research system in Nepal

The AREP (Agricultural Research and Extension Project in Nepal) was a World Bank-funded project first mooted in the early 1990s. In the mid-1990s it was designed along fairly conventional lines with a strong emphasis on MSc and PhD training and restructuring work. One of the major organisations in the project was the Nepal Agricultural Research Council (NARC). Two of the project's key restructuring goals were: (i) the encouragement of more participatory technology development (PTD) in NARC, and (ii) the promotion of linkages and partnerships between NARC and a whole range of government and non-government partners.

Actor linkage maps were used extensively at the national and regional levels and with some commodity programmes to address these issues. The maps helped to examine and understand existing relationships/partnerships and focus attention on linkages that needed strengthening.

An early project document had seen the lack of PTD activities in NARC as a major problem. However, as NARC staff actively searched for examples of linkages and working relationships, they found many examples that had not been reported through the usual research monitoring and documentation processes. One of the reasons for this was the official perception of what constituted PTD in NARC, which was that 'on-farm' and PTD research only took place in their Outreach (OR) division. This division was involved in a range of standard activities arising out of the conventional farming systems transfer of technology approach (benchmark surveys, village meetings, final stages of varietal screening, the management of a number of 'representative' outreach sites, formal impact/adoption studies, evaluations, etc.).

However, on closer analysis of who was actually doing PTD in NARC, it was revealed that a far greater number of scientists than those in the OR division were involved in a large range of innovative PTD activities. This information had not been reported in the past

because much of this type of PTD came under special projects, often conducted with a large range of international and government partners and with a number of local R&D NGOs. For years these special projects had made up a very substantial part of NARC's work.¹² The inclusion of these data gave a very different perception of the PTD situation in NARC. The actor linkage analysis helped 'reveal' a whole range of activities and linkages that were generally not acknowledged in official documents, or seen by 'outsiders' who did not know of this work. In some ways many of the PTD prescriptions for the project were already in place, but were not 'seen' or 'acknowledged'. From a new start based on what was actually happening in NARC discussions could take place on how to encourage and facilitate new PTD activities. This focused on how future PTD activities could be managed primarily by other actors in the overall national agricultural research system. Figure 4 is one of the actor linkage maps used to direct attention to these issues.

A second goal of the AREP project was to promote linkages with a whole range of non-government partners, such as local and international NGOs, international agricultural research centres, the private sector, etc. Again it was found that there already existed a great number of partnerships/linkages that were not revealed or acknowledged. However, in this case the use of actor linkage maps, where NARC was placed in the centre of the page and circles around NARC

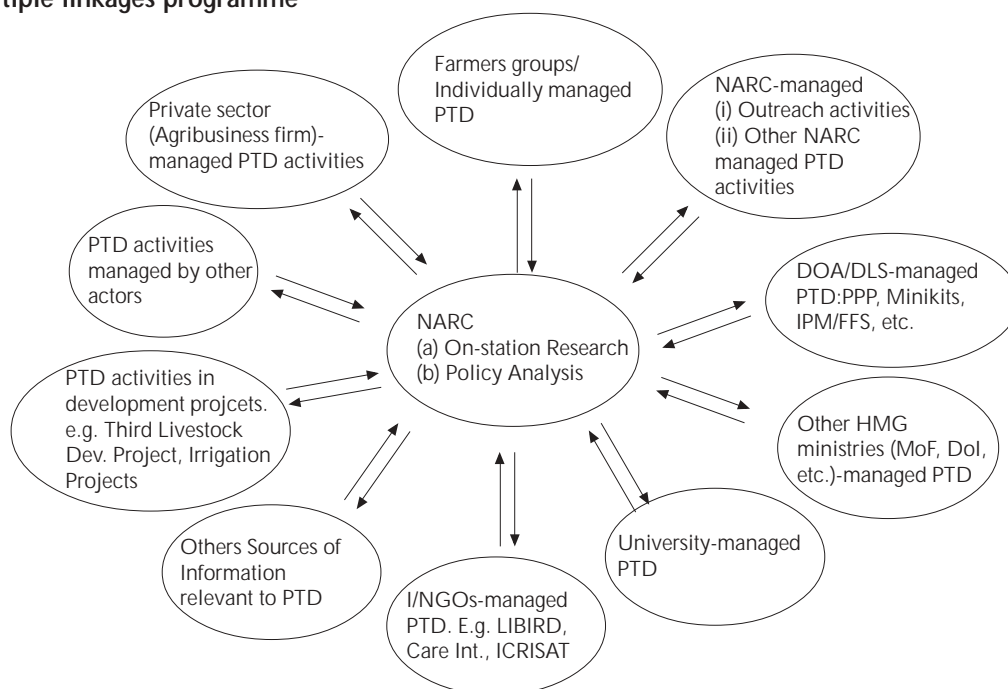
represented other existing and potential partners, helped focus attention on the need for new types of mechanisms for linkages with different categories of partners. One of these actors' maps for NARC is given as Figure 5. To go forward with the institutional reform programme NARC organised workshops at the national and regional levels to address these issues. One set of workshops looked at NARC/NGO linkages and another set discussed NARC/private sector linkages (Gauchan and Joshi, 2000).

Actor linkage maps were used in a similar way to encourage regional stations to think about how to change their role from being conventional public sector research providers, to being promoters and facilitators of a strong regional agricultural and natural resources innovation system. Regional technical working groups were established to foster partnerships between a wide range of private, government and NGO actors. Regional station chiefs found that keeping updated inventories of all R&D and development actors in each region, and promoting/facilitating regional networks of R&D actors a very different type of work from being in charge of a conventional public sector regional research station.

The actor linkage maps helped to introduce a change in institutional behaviour on the part of NARC towards old and new partners.

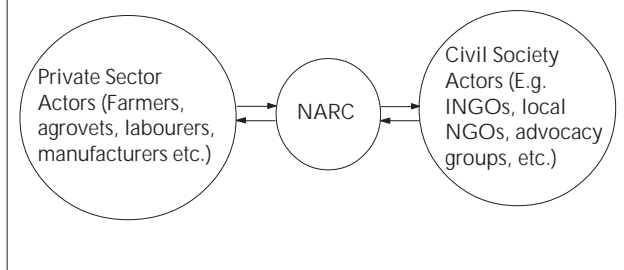
A further way actor maps were used in the restructuring of NARC was to help raise awareness about the diversity of actors and linkages in different

Figure 4 Suggested framework for NARC PTD and multiple linkages programme



Source: Gauchan, Joshi and Biggs (2003)

Figure 5 Example of an actor linkage map for NARC



technology innovation systems. The overall Nepal agricultural research and extension system is dominated by the conventional crops-oriented 'transfer of technology' conceptualisation of R&D processes. This is partly due to the long-term connections with plant breeders from the international centres for the major food crops grown in Nepal: rice, wheat, and maize. This mainstream plant breeder paradigm is very persistent and is often unthinkingly applied in policy discussions to other technologies, such as livestock, horticultural crops, agricultural engineering technologies, and even to applied social science action research. Actor linkage maps were used in a series of workshops to bring out the diverse nature of different innovation systems in Nepal. For example the actor linkage map of the Nepal horticultural innovation system diagrammatically showed that NARC was a fairly minor actor and the private sector actors bringing seeds from India and elsewhere were major actors in the existing system. In the case of the livestock innovation system, the maps revealed that the Department of Livestock had a significant research capability as did some livestock development projects. The actor linkage maps helped reveal these different institutional realities in various parts of the overall agricultural and natural resources innovation system in Nepal.¹³ While there were often lively discussions about what the future role of NARC in each of these innovation systems should be, the actor linkage maps helped keep the reality of the current situation prominent and provided a framework for thinking about future policies and programmes in a more open and outward looking way.¹⁴

As regards monitoring in the AREP project, an interesting development occurred in the mid-term review. Up to that point the project had been going very badly and there was even talk of terminating the loan, the regular monitoring missions from the Bank having resulted in a series of uncomplimentary reports. Members of the review missions had often changed, they sometimes knew little about working in Asia and they usually kept close to the original project blueprint drawn up many years previously. However, for the mid-term review the Bank team included two members who were very experienced in the analysis of research

and extension issues and practice in Asia in general and in Nepal in particular. They were up to date on contemporary thinking on pluralistic approaches to research and extension practice. The head of the team also had extensive experience in Asia. As regards monitoring and change in the project, one of the important outcomes of the review for NARC was the joint drawing up of a limited number of action plans to be monitored and reviewed every six months. The old confrontational culture between the Bank and the project changed to being one of a supportive partnership in addressing the difficult job of restructuring the Nepal agricultural research and extension innovation system.¹⁵ For its part the Bank agreed to keep the same reviewers who could come regularly every six months to discuss how NARC was progressing in implementing its own plans and what new actions needed to be included. For the Bank to keep the same reviewers, who knew the context in which understandings had been drawn up, was apparently a novel idea. However, even here there were funding problems within the Bank and it took the actions of another donor to provide funds, so that the Bank could keep to its commitment of regular monitoring by the same Bank team.

The data from these six-monthly reviews, mainly empirical evidence of institutional change taking place in the innovation system, has been summarised by Ghimire et al., 2003.¹⁶ It is an excellent example of 'process documentation' by 'insiders' who were creating the information as they went along for project management purposes. In a sense the mid-term review changed monitoring from being an 'outsider' confrontational evaluation exercise to a more useful activity, which resulted in both the Bank and NARC playing a more constructive role in a difficult task.

In summary the use of actor linkage maps made a number of important contributions to the project's aims. They provided a way to investigate, document and legitimise existing linkages, e.g. the PTD work. They provided a framework that encouraged NARC scientists to think in new ways and develop long-term changes in organisational structure and institutional behaviour. The six-monthly reviews based around the changing local action plan resulted in substantial changes in the direction and content of the project. As in all innovation systems the processes of institutional change never end. At the present time it is hard to forecast what will be the institutional characteristics of the overall Nepal agricultural and natural resources innovation system in a few years time. However, it can be predicted with confidence that a return to old government research/extension institutional models is highly unlikely, as is a return to the expatriate/international science-led institutional models of earlier years. Pluralistic institutional models are more likely to emerge, and the actor linkage maps, used so far in NARC and other agencies in Nepal, will probably continue to provide a useful framework for institutional analysis and action.

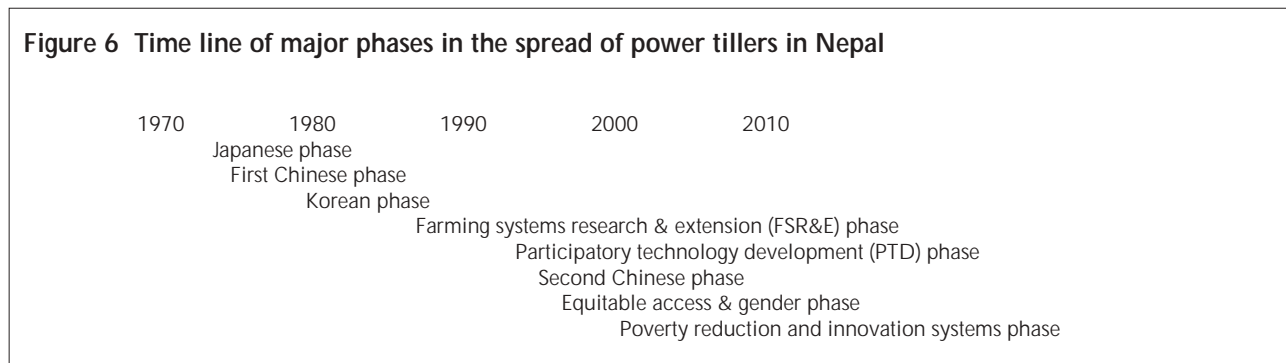
Changing power tiller innovation systems in Nepal

An actor time line has been used recently in another project in Nepal. In the early 1990s a conventional transfer of technology farming systems project was started on the *Terai* (plains), where farming is dominated by rice/wheat cropping systems. The project concentrated on the introduction and development of resource conservation technologies (RCTs). One of the principle technologies introduced was the Chinese power tiller (PT) (a two-wheeled tractor/walking tractor/mobile power unit) which can be used for, amongst other things minimum and zero tillage operations. The project has changed over the years and now has far more of an interactive participatory technology development orientation, concentrating more on poverty reduction and gender equity issues. However, one of its interesting features was that it was not linked in any systematic way with the strong, robust power tiller innovation systems that have existed in the Kathmandu and Pokhara valleys for many years. To some extent the work in the *Terai* power tiller project had proceeded as if the previous power tiller innovation systems had little to offer it. Some of this attitude was due to a perception that the power tillers in the Kathmandu and Pokhara valleys were used only for hauling construction goods and not for agricultural purposes. One of the ways of getting this project assumption (narrative) questioned was to involve core members of the *Terai* team in a discussion and writing a paper about the changing overall PT tiller innovation system in Nepal (Biggs et al., 2003). In this exercise a time line was constructed (see Figure 6).

Each of these phases is associated with a particular coalition of donor agencies and local and international actors. For example, from the end of the farming systems phase up to the current phase developments were facilitated to a major extent by a large coalition, comprising the United States Agency for International Development (USAID), the Department for International Development (UK) (DFID), the Asian Development Bank (ADB), The New Zealand overseas aid programme, the International Fund for Agricultural Development (IFAD), the International Maize and Wheat Improvement Center (CIMMYT) and the Nepal

Agricultural Research Council (NARC). The time line has helped the current promoters of power tillers to investigate the outcomes of earlier projects and put their own work into an overall contextual perspective. One of the activities this led to was a brief exploratory survey by the current team of the power tiller innovation system in the Kathmandu Valley. They investigated ownership patterns, usage patterns, and service rental arrangements, etc. This has already led to a major change in the team's perceptions of the Kathmandu power tiller system. They found that power tiller use for periods of peak agricultural demand was highly integrated with use for construction haulage work. This helped the *Terai* project staff to change the emphasis of their work and encourage the use of power tillers for both transport and agricultural purposes. The *Terai* group also learnt that power tillers in the Kathmandu Valley are owned by entrepreneurs (often rural entrepreneurs) who sometimes have some land of their own, in which case the power tillers are first used on their own land at times of peak agricultural demand, before being hired out to others. Generally power tiller operators were hired to operate the tractors. This quick analysis of the Kathmandu system led the *Terai* project staff to investigate more fully the rural entrepreneur/service provider dimensions of power tillers in their own work. They have quickly learnt a lot more from the Kathmandu system. This includes information on how power tillers have been maintained over many years with little access to international markets for spare parts, and how local industries have developed and manufactured locally relevant equipment. Getting the project staff to stand back from busy day-to-day activities has been a challenge. However, investigating the history of the spread of power tiller technology and learning from these other ongoing and changing innovation systems in Nepal has resulted in the project making a better use of relevant, available local knowledge. The time line helped play a role in this reflection and learning process.

One of the features of the power tiller projects is that it has partners from a wide range of different institutions; also power tillers are part of other projects with different management, monitoring and reporting structures. In order to manage the poverty reduction



component of the power tiller project, the 'coalition' around this set of interests has established for itself a simple 'learning and response' mechanism. Each six months they meet and decide what they have learned from planned sources (surveys, experiments and other planned activities), from other information picked up while doing their planned work, and from unexpected changes in the contextual environment. They then decide what the implications of this information are, and draw up a tabular plan of action for themselves for the next six months. The team has found that this simple table helps them to focus on what changes are needed. The action plan is for them, and does not include recommendations concerning what 'policy makers should do' or what others 'should do'. As an example, some of the agricultural engineers wanted to continue with the on-farm experiments to show that zero and minimum tillage was a good resource conservation technology. Others in the group contended that this was already known from previous on-farm trials and that the technology was rapidly spreading in the areas where the trials had been carried out, meaning that further experiments of the same type were unnecessary, even if they were budgeted for. Different experiments might be justified, but they thought it would be better at this stage to concentrate on methods of disseminating the 'proven technology'. In consequence, plans for the next six months included emailing the relevant public sector extension agencies and making contacts with major donor and NGO development projects.

An example of picking up 'unexpected' information was the team's discovery, while engaged in on-farm activities, that power tillers were spreading without their knowledge in adjoining areas and districts. This was taking place outside of any planned activities. The outcome of this unexpected information was that a quick exploratory survey was planned for the whole team. There was a great deal of interest in what was going on, and what could be learnt by the project from these adjoining areas. Significantly the group did not send 'a socio-economic team' off to investigate and write an adoption report!

Another example of how the project responded to totally unexpected changes in the context of the project is shown by their response to talk in some government quarters of introducing a tax on the import of farm machinery, which would be a total change in government policy. In order to inform the debate on such possible changes the team decided to divert resources to work with some existing and new partners to produce a policy discussion paper on rural mechanisation in Nepal and to distribute earlier papers and reports to policy makers. The distribution will be quick and widespread amongst those who influence policy processes and practice. The team is finding that the learning and project response table is helping them to focus on changing priority issues, and manage their work accordingly. An analysis of the content of the

tables at some future date will enable an assessment of how innovative the project was in learning and responding to new information and opportunities as it went along.

In summary, this case study has illustrated how actor time lines and a learning and response table have helped the project to: change the perceptions of its work, start learning from local knowledge which earlier had not been recognised as important, and how to increase the learning and responsiveness of the project to information as it becomes available. Some might well argue that we are taking about nothing new here. True, but we argue that the actor-oriented tools described here have shown themselves to be useful, and might be useful to others.

3 DISCUSSION AND REFLECTIONS

Actor-oriented tools have helped us to:

- map a given innovation system visually and analyse strengths, weaknesses and opportunities in the system;
- encourage technology users to look at existing (often unexpected) strengths in an innovation system and analyse the institutional implications of this;
- provide a framework whereby actors in a specific innovation system have been able to change their perceptions of their role and relationships to other actors in the system;
- provide tools for planning, monitoring and evaluating coalition building and information flows;
- provide tools which are appropriate for use by groups (as part of coalition building).

We have found the tools to be valuable in keeping partnerships, relationships and sharing information high on the research agenda. Their use helps to legitimise and reward actors who actively build linkages in their work. They often provide a more structured way of strengthening institutional innovations that are already taking place, but the importance of which have often not been acknowledged.

As the case studies show, the approach we are advocating is not about observing and analysing innovation systems from the outside. We are concerned with developing approaches which can help actors and ourselves as non-neutral actors, to reflect and learn as we act on the inside.

Our experiences of working with these tools have raised a number of issues, which are important to consider when using the tools in future.

Political issues in using actor-oriented tools

These tools are all about human relationships and therefore cannot help but be political. They need to be used with sensitivity, awareness and with an acknowledgement that the user is never neutral. Actor-oriented tools may reveal information which some actors may not find easy to accept. It is also important to realise that different actors may have different

interpretations of reality and that these interpretations may be politically motivated. The actor time lines help to reveal some of these orientations in perceptions. To some extent the actor approach is enabling some topics that used to be seen as 'academic' political economy subjects to be brought out into the open and analysed within the framework of development activities.¹⁷ In the past the analysis of natural resources and agricultural innovations systems was often 'deinstitutionalised' and 'depoliticised' by using actor linkage maps which only had on them 'Farmers (beneficiaries)', 'Researchers' and 'Extension Department', with two-headed arrows between them. Often the funders of research were not on the map and the motives and reward structures within those and other organisations were not systematically analysed. Another way of 'depoliticising' and 'deinstitutionalising' the analysis of innovation systems was to restrict planning and evaluation exercises to narrow types of financial and economic analysis. The actor approach we are suggesting here enables one to break out of these depersonalised, depoliticised, and deinstitutionalised frameworks of analysis.

Because of the political nature of this approach, when planning the use of these tools it is important to begin by being aware of your own aims and use the tools accordingly. These are not instruments to be added to the tool bag of PRA, etc., to be taught in a short-term training.¹⁸ If the tools are being used for project and programme planning, preparation and building coalitions, it is particularly important that they are used in a constructive way. Like all tools, they can be used for a wide range of purposes.

For example, we found in some situations that quantifying linkages (something which is very tempting) can be unproductive as the value given to a linkage is somehow 'set in stone'. It seems to be less controversial and so more productive to identify strengths and 'areas where there are further opportunities for intervention' rather than give quantitative weights to strong or weak linkages. In addition, this is not 'just a matter of semantics'. The way things are spoken about and used is important. The quantification of some linkages in an objective way can also lead sometimes to an unjustified confidence in the figures produced. As with all analytical approaches and tools there is always the political economy question for those concerned. This concerns whether members of development coalitions wish to be effective in policy processes and development practice that results in effectively bringing about such things as poverty reduction and the social inclusion of marginalised groups.

Importance of events and key locations

An event such as a fair or a seminar or locations, e.g. marketplaces, can be critical in developing linkages and coalitions. We have found it useful to identify key events and locations at the same time as doing our 'actor analysis' to identify key actors. The actor event

time line also helps to pinpoint why key events in the past were effective in some way. It also makes the team more aware that 'meetings' 'platforms', 'workshops', 'seed fairs', to be effective in bringing about change in the innovations system, have to be planned with great thought. We are not talking here about 'ritualistic' meetings, which are planned and organised for a whole range of other reasons.

Importance of individual actors

In her study of power systems in rural Bangladesh, Brigitta Bode (2002) recognises the enormous power of local elites and recommends that NGOs identify the 'good kings' amongst the elite who can work with them and patronise their activities. The work of Tandler (1997) in analysing 'success stories' in technology diffusion in Brazil also points to the importance of key individuals in some processes. The actor approach enables us to move beyond structural linkages to unique opportunities, which may depend on a particularly innovative or dynamic personality. The actor event time line exercises often bring out the important role that a key individual played in past innovation processes. In the actor linkage matrix key individuals can be given a cell of their own.

Actor linkage maps versus actor linkage matrices

Judgement has to be used as regards when to use one or the other of these tools. In the Nepal situation, the actor linkage maps were the most useful way to get people to think about ways to strengthen linkages with new actors and develop new mechanisms to facilitate these linkages. In a number of meetings where actor linkage matrices were discussed the tool did not appear to be of use. In the Bangladesh case the situation is different. Here a small, stable group uses the matrix frequently. As the group now understands and feels comfortable with the ALM, it has become a useful thinking tool: a way to visualise the institutional context, to monitor the impact of activities and to plan future activities. To some extent, all the tools discussed here are time- and location-specific. Professionals with experience in the use of these tools have to take opportunities as they arise to use them as and when appropriate. In a development situation the context determines what is useful to be used when. In a more academic context one might attempt to be more 'rigorous' in the pre-planned research design. However, this is not too different from any creative research process. As those who are experienced in creative research processes (rather than repetitious technical/social science research) know, analytical frameworks and tools are generally adapted and changed as the work proceeds.

A role for quantification?

In some cases a more critical use of the matrix, or quantifying linkages, might be appropriate, for example

where team members are setting themselves linkage goals and monitoring their performance. Here they might find it useful to set criteria for ranking the strength of a linkage. Methods for assessing the strength of a linkage will be highly location- and time-specific because of the institutional culture in different settings. For example, in one setting, having a meeting of some actors who normally never meet could be a major positive achievement. In another situation, having a meeting of those actors might be just a continuation of mechanical or ritualistic meetings and be more an indicator of 'business as usual', rather than of significant change.¹⁹ Similarly quantification might be useful for a baseline assessment of an innovation system. However, even here one has to avoid the pitfalls of old approaches where people thought 'baselines' could be established against which progress could be 'impartially' monitored and evaluated. The case study of the Nepal Agriculture Research Council clearly showed that the project 'benchmark' assertions that there was little PTD research taking place and that NARC had few non-government R&D partners were misleading. In this case this was partly due to the fact that no social science professionals with institutional analytical skills had been included in the project preparation team, although almost all the project was about restructuring and institutional change. It was not until the mid-term review that these issues were addressed in a more substantial way and the overall culture of the project changed (Biggs and Smith, 2003).

Cultural dimensions of transaction costs

One of the advocacies of many of today's aid projects is to reduce transaction costs. Often this has come in response to the fact that some government procedures are inordinately slow and involve files being moved and signed many times. The actor tools presented here help to address transaction cost issues in a number of ways. First, they give a framework in which transactions between actors can be conceptualised and systematically analysed. Second, they provide a framework in which new types of transaction mechanisms can be explored. Third, they keep issues such as perceptions and culture to the forefront of the analysis. For example, in the Nepal agricultural research restructuring example, no amount of training in new stakeholder collaboration methods and accounting procedures to reduce formal 'transaction costs' would have produced results while there was a culture of confrontation and little trust between the World Bank and the AREP project. In the Bangladesh case, the culture of the extension service (and the perceptions of its staff) was that it worked in all areas of the country. Until this culture was challenged and a different reality acknowledged, there would have been little use in talking about minimising transactions costs in the context of any of the actors involved, let alone talk about ways to develop new long-lasting partnership

relationships. The use of the actor linkage maps and the actor time lines in the historical analysis of power tillers in Nepal has helped change the inward-looking 'special project' culture that is so prevalent in Nepal. What in the past was seen as a negative transition cost (i.e. the negative costs of having to go and contact and work with extension and other development agencies) is now being seen as a worthwhile 'investment' to keep the research more focused and have partners who run with the new technology.

Finally, the tools help to remind us that any analysis of transaction cost will be very different in a highly democratic social/political system from that of an authoritarian system.

Keep it simple

It is tempting to be complex. But in order to use these tools productively, i.e. interactively, they must be kept simple and specific to the political and socio-economic cultures in which they are used. It's better to have several maps, several matrices, several time lines rather than trying to describe too much in one place. Membership of meetings to use the tools needs to be thought out very carefully. Trying to use the actor linkage matrix with a wide range of actors can result in difficulties in convincing some people present of its usefulness.

The actor-oriented approach to innovation systems encourages the user to look at the whole range of actors involved in an innovation system, including the users of these techniques and their roles. In the Bangladeshi case our research key actors and potential future coalition members include farmers, *Bangla*-speaking government field staff, businessmen and a business advisory service. Some of these actors are unfamiliar with research and have difficulty understanding the point of these techniques. We found that non-researchers, and even some technical researchers, tend to take relationships as 'obvious' and are eager to move on to the action stage immediately! In the case of public sector researchers they often underestimate the challenges involved when working with the private sector and NGOs. While public sector personnel have rules and procedures about the way invitations for meetings are made and transferred, some of these mechanisms (some of the substance of linkages) do not work when inter-acting with the private and NGO sectors. For example, while a senior bureaucrat in a Ministry might send an invitation for a workshop to person in a lower level department and expect the person to attend, in the case of NGO personnel, farmer groups, etc., they may have other important competing schedules and may not be able to attend without prior consultation as regards the timing and location.

Involving people in the mapping and analysis seems to help build some awareness of the usefulness of the technique. This is another reason to keep the tools simple and strive to make them user friendly.

4 CONCLUSIONS

We hope we have shown that the actor approach and the tools presented here can be useful in understanding innovation systems and as a basis for planned action and change. We feel that the techniques are relevant to addressing many of the issues which actors in contemporary innovation systems are now facing. The techniques are complementary to other research and planning methods. They have their strengths and weaknesses. Like all theories, methods and tools they have to be handled with care, with experience and in a responsible way.

REFERENCES

- Ashford, T., and Biggs, S. (1992) 'Dynamics of rural and agricultural mechanisation: The role of different actors in technical and institutional change'. *Journal of International Development*, Vol. 4, No. 4, pp. 349–74.
- Bennett, L. (2003) 'Towards an inclusive society: Agency, structure and diversity in Nepal'. Paper presented at 'The agenda of transformation: Inclusion in Nepali democracy' organised by the Social Science Baha, Kathmandu, 24–26 April 2003.
- Berdegue, J.A. and Escobar, G. (2002) 'Rural diversity, agricultural innovation policies and poverty reduction'. *Agricultural Research and Extension Network Paper No. 122*. London: Overseas Development Institute.
- Biggs, S., (1990) 'A multiple source of innovation model of agricultural research and technology promotion', *World Development*, Vol.18, No.11, pp. 1481–99.
- Biggs, S., Justice, S., Gurung, C., Tripathi, J. and Sah, G. (2003) 'The changing power tiller innovation system in Nepal: An actor oriented analysis'. Draft. Paper prepared for Workshop on Agricultural and Rural Mechanisation, Bangladesh Agricultural University, Mymensingh, 2 November 2002 (revised 4 March 2003).
- Biggs, S. and Matsuert, H. (1999) 'An actor oriented approach for strengthening research and development capabilities in natural resources systems'. *Public Administration and Development*. Vol. 19, pp. 231–62.
- Biggs, S. and Matsuert, F. (2000) 'An actor oriented approach to micro and small enterprise development: A Namibian case study' in D. Lewis and T. Wallace (eds) *New roles and relevance: development NGOs and the challenge of change*. Bloomfield, CT: Kumarian Press.
- Biggs, S. and Smith, G. (1998) 'Beyond methodologies: Coalition-building for participatory technology development'. *World Development*, Vol. 26, No. 2, pp. 239–48.
- Biggs, S. and Smith, S. (2003) 'Paradox of learning in project cycle management and the role of organizational culture.' *World Development*, Vol. 31, No. 10, pp. 1743–1757.
- Biggs, S. and Underwood, M. (2001) *Review of the crop post harvest research programme: Partnerships and innovation systems*. Crop Post Harvest Programme (CPHP). Chatham, UK: NRI.
- Blumenthal, D. and Jannink, J.L. (2000) 'A classification of collaborative management methods'. *Conservation Ecology*, Vol. 4, No. 2, p. 13.
- Bode, B. (2002) 'In pursuit of power: Local elites and union level governance in rural north-western Bangladesh'. Dhaka: CARE.
- Bromley, D.W. (1989) *Economic interests and institutions*. Oxford: Basil Blackwell.
- Byerlee, D. (1998) 'The search for a new paradigm for the development of national agricultural research systems'. *World Development*, Vol. 26, No. 6, pp. 1049–55.
- Clark, N. (1995) 'Knowledge systems: Interactive nature of knowledge systems: Some implications for the Third World', in *Science and Public Policy*, Vol. 22, No. 4.
- Clark, Norman, A. Hall, R. Sulaiman and G. Naik, 2003, 'Research as Capacity Building: The Case of an NGO Facilitated Post-Harvest Innovation System for the Himalayan Hills,' *World Development*, Vol. 31, No. 11, pp. 1845–1863
- Crew, E. and Harrison, E. (1998) *Whose development. An ethnography of aid*. London: Zed Books.
- Davies, R. (2002) 'Improved representations of change processes: Improved theories of change'. Paper prepared for the 5th Biennial Conference of the European Evaluation Society: 'Three movements in contemporary evaluation: Learning, theory and change', 18 October 2002. www.mande.co.uk
- Douthwaite, B. (2002) *Enabling innovation: A practical guide to understanding and fostering technological change*. New York and London: Zed books.
- Ekboir, L. (ed.) (2002) *CIMMYT 2000–2001 world wheat overview and outlook: Developing no-till packages for small-scale farmers*. Mexico, DF: CIMMYT.
- Ellis, F., and Biggs, S. (2001) 'Evolving Themes in rural development 1950s–2000s,' *Development Policy Review*, Vol. 19, No. 4, pp. 437–448.
- Eyben, R. (2003) 'Relationships matter for influencing pro-poor change in Asia'. Report commissioned by Department for International Development, UK. Institute of Development Studies, University of Sussex, UK.
- Falcon, W.P. (1967) 'Agricultural and industrial inter-relationships in West Pakistan', *American Journal of Agricultural Economics*, Vol. 49, No. 5, December, pp. 1139–54.
- Freeman, C. (1988) 'Japan: a new national system of innovation?' in G.Dosi et al., (eds), *Technical Change and economic theory*. London: Pinter Publishers.
- Gasper, D. (2000) 'Evaluating the "Logical framework approach" – towards learning-oriented development evaluation' *Public Administration and Development*, Vol. 20, No. 1, pp. 17–28.
- Gauchan, D. and Joshi, M. (2000) 'NARC roles and linkages with private sectors in participatory

- agricultural technology development: Issues and concerns'. *Special Publication Series ORD 5/2057-58*. Paper presented in the NARC – Private Sector Consultation Meeting, 27 July 2000. Kathmandu: Nepal Agricultural Research Council.
- Gauchan, D., Joshi, M. and Biggs, S. (2000a) 'A new NARC strategy for participatory technology development and linkages with multiple actors: A discussion paper'. *Special Publication Series ORD 3/2057-58*. Kathmandu: Nepal Agricultural Research Council.
- Gauchan, D. and Joshi, M. (2000b) NARC roles and linkages with private sectors in participatory agricultural technology development: Issues and concerns. *Special Publication Series ORD 5/2057-58*. Kathmandu: Nepal Agricultural Research Council.
- Gauchan, D., Joshi, M. and Biggs, S. (2000c) 'The horticultural research and development system in Nepal: A new strategy for Nepal'. *Special Publication Series ORD 6/2057-58*. Kathmandu: Nepal Agricultural Research Council.
- Gauchan, D., Joshi, M. and Biggs, S. (2003), 'A strategy for strengthening participatory technology development in agricultural and natural resources innovations systems. The case of Nepal'. *International Journal of Technology Management and Sustainable Development*, Vol. 2, No. 1, pp. 39-52.
- Gellner, D. Hirsch, E. (eds) (2001) *Inside organizations: anthropologist at work*. Oxford: Berg.
- Ghimire, Y. N., Pokhrel, T. P., Gauchan, D., Joshi, M., Thakur, N. S. and Khadka, R. (2003) 'Recent spread of improved R and D linkages in national research system of Nepal'. in M. Joshi, and N.S. Thakur, (eds), (2003) *Recent spread and impact of agricultural technologies in Nepal. Proceedings of the Sixth National Outreach Workshop, Khumaltar, Lalitpur, 4th July 2002*. pp. 6-13. Kathmandu: Nepal Agricultural Research Council.
- Grimble, R., and Wellard, K. (1997) 'Stakeholder methodologies in natural resource management: A review of principles, contexts, experiences and opportunities' *Agricultural Systems*, Vol. 55, No. 2 pp. 173-193
- Hall, A., Bockett, G. Taylor, S., Sivamahan, M.V.K. and Clark, N. (2001) 'Why research partnerships really matter: Innovation theory, institutional arrangements and implications for developing new technology for the poor'. *World Development*, Vol. 29, No. 5, pp. 783-98.
- Hogg, D. (2000) *Technological change in agriculture: locking in to genetic uniformity*. Basingstoke, UK, and New York: Macmillan Press (UK) and St. Martin's Press (USA)
- ISNAR (2001) 'Meeting the challenge of ecoregional research'. International Workshop on Organizing and Managing Ecoregional Programmes. International Agricultural Centre, Wageningen, The Netherlands, 26-28 March 2001. The Hague: International Service for National Agricultural Research.
- Kayastha, B.N., Mathema, S.B. and Rood, P. (1989) 'Nepal: Organisation and management of on-farm research in the national agricultural research system', *OFCOR Case Study* No. 4, The Hague: International Service for National Agricultural Research (ISNAR).
- Kidd, J. (2002) 'Agricultural and rural livelihoods: Is globalisation opening or blocking paths out of rural poverty?' *Agricultural Research and Development Network Paper* No. 121. London: Overseas Development Institute.
- Krishna, A., Uphoff, N. and Esman, M.J. (eds) (1998) *Reasons for hope: Instructive experiences in rural development*. West Hartford, CT: Kumarian Press.
- Lewis, D.J., (1998) 'Partnership as process: Building an institutional ethnography of an inter-agency aquaculture project in Bangladesh', in D. Mosse, J. Farrington and A. Drew (eds). *Development as a process: Concepts and methods for working with complexity*. London: Overseas Development Institute and New York: Routledge.
- Long, N. and Long, A. (1992) *Battlefields of Knowledge*. London: Routledge.
- Long, N. and Van Der Ploeg, J.D. (1989) 'Demythologizing planned intervention: An actor perspective' *Sociologia Ruralis*, Vol. 29, No. 3/4, pp. 226-49.
- Matsaert, H. (2003) An introduction to actor oriented tools, available at www.developmentwheel.org
- Messerschmidt, D. (ed.) (1981) *Anthropologists at home in North America: Methods and issues in the study of one's own society*. New York: Cambridge University Press.
- Mosse, D., (2001) 'Social research in rural development projects' in D. Gellner and E. Hirsch (eds). *Inside organizations: Anthropologist at work*. Oxford: Berg.
- Mosse, D., Farrington, J. and Drew, A. (eds) (1998) *Development as a process: Concepts and methods for working with complexity*. London: Overseas Development Institute and New York: Routledge.
- Mundy, P. (2003) 'Knowledge systems matrix'. (<http://www.mamud.com/knowledgesystems.htm>)
- Nelson, R.R. and Winter, S.G. (1977) 'In search of useful theory of innovation'. *Research Policy*, Vol. 6, No. 1, pp. 36-76.
- ODA (1995) *Guidance note on how to do stakeholder analysis of aid projects and programmes*. London: Social Development Department, Overseas Development Administration, HMG.
- Pandey, S.B., Kuwar, B.S. and Biggs, S. (2002) 'Changing goat technology innovation system in Nepal: Past outcomes and future directions'. Draft. Kathmandu: Nepal Agricultural Research Council.
- Raina, R.S. (2002) 'Disciplines, institutions and organisations: Impact assessments in context'. Paper for the international conference 'Why has impact assessment research not made more of a difference?', 4-7 February 2002, San Jose, Costa Rica.

- Ramirez, R., (1999) 'Stakeholder analysis and conflict management' in Buckles, D. (ed) (1999) *Cultivating peace: Conflict and collaboration in natural resources management*. Chapter 5, pp. 101–126 Ottawa: International Development Research Centre.
- Roling, N. and Jiggins, J. (1998) 'The ecological knowledge system' in N. Roling and A. Wagemakers (eds). *Facilitating sustainable agriculture. Participatory learning and adaptive management in times of environmental uncertainty*. Cambridge: Cambridge University Press.
- Squires, S. (1999) *American plant improvement for African farmers? An anthropology of technology development*. Thesis submitted for the degree of PhD, Department of Anthropology, University of London.
- Subedi, A. (2000) 'Linkages and partnership in agricultural research: Experience of a Nepalese NGO, LI-Bird' in M. Joshi, D. Gauchan and N. Thakur *Proceedings of the 5th National Outreach Research Workshop 30–31 May 2000*. Kathmandu: NARC.
- Temel, T., Janssen, W., and Karimov, F. (2003). 'Systems analysis by graph-theoretic techniques: Assessment of the agricultural innovations system of Azerbaijan'. *Agricultural Systems*, Vol. 77, No. 2, pp. 91–116.
- Tendler, J. (1997) *Good government in the tropics*. Baltimore MD: Johns Hopkins University Press.
- Westendorp, A. and Biggs, S. (2003) 'Strengthening social capital in agricultural and natural resources innovation systems: The case of the community IPM farmer field schools (FFSs) Programme in Nepal'. School of Development Studies, University of East Anglia, Norwich, UK. (March 2003, Draft Paper).
- systems (Clark, 1995). Biggs and Smith (1998) in their analysis of natural resource research systems also emphasise the importance of coalitions in R&D activities: 'the effectiveness of coalitions will often be a key determinant of long term impacts of technical innovations'. These findings are supported in a recent review of innovation systems by Blumenthal and Jannink (2000) who observe that 'collaboration among multiple stakeholders can be crucial to the success of natural resources management'.
- 4 Of course, if institutional strengthening of innovation systems is a goal of projects/ programmes these topics can be systematically addressed and brought into log frames, and indicators developed to monitor the strengthening (or weakening) of the institutions (Gasper, 2000).
 - 5 For a recent brief and practical introduction to the actor oriented tools presented here see Matsuert, 2003. For a review of literature on planning, monitoring and evaluation, and a description of the actor approach as it might be applied to natural resources policy and management processes see our earlier paper, Biggs and Matsuert, 1999.
 - 6 For some early systematic attempts to use actor linkage matrices see the publications of the ISNAR study on the On-farm client oriented research (OFCOR) project (e.g. Kayastha et al., 1989). However in that study they were used in an external, *ex post* evaluation mode. In this paper we are looking at the way these tools can be used within planned policy and development activities. A useful new addition to the literature on ethnographic research methods is by Gellner and Hirsch, 2001. Readers interested in contemporary ethnographic studies of development actors should see the papers prepared for the workshop on Order and Disjuncture: The Organisation of Aid and Development organised by David Lewis and David Mosse, 26/27 September 2003, at the School of Oriental and Asian studies (SOAS), University of London. The papers are available at the web site: <http://www.soas.ac.uk/departments/departinfo.cfm?navid=460>
 - 7 For an example of where actor linkage maps were used to highlight the need to bring 'research funders' into the analysis of innovation systems see Gauchan, Joshi and Biggs (2003).
 - 8 This can easily be set up on Microsoft Excel.
 - 9 Ellis and Biggs (2001) used a time line to map major changes in the mainstream agricultural and rural development discourse from 1950 to 2000. The article was written from an agricultural economist's perspective. To some extent that article documented the product of using this tool of analysis in rural development postgraduate teaching for many years in the School of Development Studies, University of East Anglia, UK. It is interesting to note that David Mosse uses a similar

ENDNOTES

- 1 For example, if an international crop research programme were to conduct a systematic technical/economic analysis to establish priority regions to work in, the tools of this actor analysis could be used to help systematically establish how such technical priorities might be 'implemented'. The tools then help address the issues of which actors would play which roles and in what way, in different situations, in the ever-changing political, cultural, economic and institutional context in which S&T takes place.
- 2 Institutions are the formal and informal 'rules of the game', while organisations are the formal institutes that make up the system, e.g. research institutes, private and public sector extension agencies, membership organisations, registered NGOs, etc. Following Bromley, we use the term institutions in a general way to mean both the rules of the game and the formal institutions.
- 3 This is similar to the findings of Norman Clark who stresses the importance of interactiveness in dynamic Science and Technology (S&T) knowledge

tool to encourage reflection and learning in a university teaching context in London (Mosse, 2001). At the International Center for Tropical Agriculture (CIAT), Colombo, Boru Douthwaite is developing a tool called The Innovation Life Histories and How to Construct Them. This is another example of attempts being made to strengthen empirically based reflective learning within agricultural research systems, and highlight that there are often many contending and competing historical narratives about cause and effects relationships in past innovation systems.

- 10 In our earlier paper we illustrate how these tools can be used in an *ex post* project evaluation of a farming systems research and extension project in Namibia (Biggs and Mutsaers, 1999). A similar *ex post* analysis was carried out on a micro enterprise project in Namibia (Biggs and Mutsaers, 2000).
- 11 In a recent discussion of social science research methods that have largely evolved from within development situations Mosse (2001) defines two main streams of methods: (i) Participatory Learning (also known as Participatory Rural Appraisal (PRA)), and (ii) Process Documentation Research or process monitoring. In the first category it is unusual for the 'researcher or development team' to place themselves in the actor linkage map and systematically analyse their relationships with different actors. In process monitoring it more usual for the researcher or development team to be reflective and consciously analyse their own behaviour and its effects on other actors. Therefore they are more likely to include themselves in the actor linkage map. In the actor approach we are investigating here the researchers (or team) are always included in the actor linkage map. As much of the analysis is about their motives, roles and behaviour with respect to other partners, as it is about looking at the relationships between other actors in that specific context. As part of the present research activity one of the authors (SB) is following another type of insider/outsider research methodology. In this work the 'outsider' (SB) is working very closely with 'insiders' to write up actor-oriented contemporary ethnographies of the innovation systems of which they are a part. For example see Westendorp and Biggs, 2003; Biggs et al., 2003; and Pandey, Kuwar and Biggs, 2002 . While there are predictable problems as regards 'the objectivity' of the analysis there are great advantages in that the documents carry with them a degree of 'insider' authenticity and in-depth analysis and insights that studies by 'outsiders' do not carry. Tandler's perceptive studies of rural development 'successes' in Brazil were conducted by an 'outsider'. The autobiographical studies of successes in Krishna, Uphoff and Esman, 1998, are totally written by the insiders themselves. Messerschmidt's book, *Anthropologists at home in North America: Methods and issues in the study of one's own society*, takes up the theme of looking at the problems faced by anthropologists who work as 'outsiders' but study their own home cultures.
- 12 There was also a great deal more PTD taking place in NARC if one took into account the informal personal contacts scientists had with farmers, NGOs, farmers' associations, consultancy companies, etc. In addition some NARC researchers were farmers themselves and some, in their private capacity, had seed multiplication farms. However, these informal linkages were not investigated at the time.
- 13 The NARC outreach division published the papers describing these different major innovation systems in the agricultural sector. They were all written for planning workshops attended by major actors in each of the innovation systems. The papers covered crops and soil fertility (Gauchan, Joshi and Biggs, 2000 a), livestock (Gauchan, Joshi, and Biggs, 2000 b) and horticultural crops (Gauchan, Joshi, and Biggs, 2000 c). An excellent paper by Subedi at an outreach workshop in July 2000 showed how actor linkage maps could be used to represent the ways a major local NGO (LIBIRD), made different types of partnership linkages in different projects with government, private and NDO actors (Subedi, 2000).
- 14 Gauchan (pers. comm.) observes that the actor approach has helped NARC staff to envision the new NARC mandate and thrust areas in the recently developed and published NARC long-term vision for 2021.
- 15 For a more detailed analysis of the Nepal case and the importance of addressing in a substantial, analytical way cultural issues within projects, programmes, development coalitions, etc. see Biggs and Smith (2003).
- 16 For readers interested in how to define, record and measure changes in 'social capital' this paper makes good reading. It uses similar indicators to those used in Lewis (1998) and Westendorp and Biggs, 2003.
- 17 For an ethnography of aid which has a strong orientation towards natural resources innovation systems see Crew and Harrison, 1998. For ethnographically oriented studies of international/national natural resources and agricultural research systems see Squires (1999) and Hogg (2000).
- 18 Although, of course, we recognise there will be reflective, open-minded people who may be exposed briefly to the tools and integrate them into their personal and professional life accordingly.
- 19 Because of the diversity of political, cultural and institutional contexts in which actor approaches are used it would be unwise to try and come up with international or global indicators to assess changes in linkages and other institutional characteristics of innovations systems.

AgREN

Network Papers cost £3.00 sterling each (plus postage & packing).

This paper may be downloaded free of charge from the AgREN website at: www.odi.org.uk/agren

Please contact the Network Administrator at:

The Overseas Development Institute, 111 Westminster Bridge Road, London SE1 7JD, UK

Telephone: +44 (0)20 7922 0300 Fax: +44 (0)20 7922 0399 Email: agren@odi.org.uk



Information about ODI and its publications can be found on our website at:

<http://www.odi.org.uk/>