

# **ACTOR ORIENTED TOOLS FOR ANALYSIS OF INNOVATION SYSTEMS**

## **Some guidelines from experience of analysing natural resource based innovation systems in Bangladesh.**

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### **SECTION 1. INTRODUCTION**

These guidelines are based on our experiences of using actor oriented tools to analyse chilli and livestock innovations systems and identify pro poor interventions in the char lands of Bangladesh, and in sharing and discussing these tools with other development partners. For more information see our research project report (Matsuert et al 2004 An Actor Oriented Analysis of Chilli and Beef Production in the Jamalpur Chars of Bangladesh).

#### **What do we mean by an Actor Oriented Approach?**

Innovation systems are made up of a range of actors involved in the generation and use of new knowledge, technologies, management practices, marketing processes and institutional relationships.

The actor oriented approach is based on the premise that a healthy and effective 'innovation system' is one where there are strong flows of information and useful partnership coalitions between key actors over time. This view has been strongly supported by studies of innovation processes (see for example Douthwaite B 2002, Enabling Innovations).

The importance of partnership in development interventions is widely accepted by those working in development. However, it is our experience that, in practice, the issue of how to build strong links and partnerships is often neglected. One of the reasons for this is the lack of tools to allow development actors to analyse actor links and to plan, monitor and evaluate interventions which relate specifically to this aspect of their work.

The actor oriented approach followed in this research, focuses on identifying the key actors in a system, mapping the links and information flows between them and looking at how these inhibit or support pro poor innovations. The actor oriented tools described below have been designed specifically to assist development actors to integrate linkage and partnership issues more fully into their work.

These tools are drawn from a wide range of sources. These include social anthropological and social network research techniques (see Long and Long 1992, Lewis 1998), stakeholder analysis (see Grimble and Wellard 1997), agricultural information knowledge systems (see Roling and Jiggins 1997) and process monitoring and documentation (see Mosse et al 1998). However, the tools are not commonly found in the analysis and planning of interventions in natural resource based innovation systems<sup>1</sup>.

Actor oriented tools complement other planning, monitoring and evaluation tools by focusing on the structure of social relationships between the key actors involved in a development scenario. We have found them useful for:-

- **Analysis** of a given institution (e.g organisation or enterprise, project or sector) in terms of strong and weak linkages between its 'actors'.
- **planning**: visual presentation of critical links which should be supported or developed to meet the overall development goals e.g poverty reduction, inclusion of marginal groups.
- **monitoring and evaluation**: visualising how interventions have impacted on critical linkages over time.

The tools which we have used and which are described in detail in this paper are:

| <b>Tool</b>                      | <b>Brief Description</b>   | <b>Objective</b>   |
|----------------------------------|--|--|
| <b>1. Actor Time Line</b>        | Similar to PRA time line, but focuses on key actors and innovations. | To understand the dynamics of an innovation system and identify key actors.        |
| <b>2. Actor Linkage Maps</b>     | Arrows used to plot links between key actors.                        | To identify key actors.<br><br>To visualise the links between key actors.          |
| <b>3. Actor Linkage Matrices</b> | Links between key actors plotted onto an excel matrix.               | To summarise and analyse findings. For planning, monitoring and evaluating change. |
| <b>4. Determinants</b>           | Group exercise focusing  | Used for in depth analysis   |

<sup>1</sup> For examples of use by others in NR innovation systems see Ramirez 1997 Understanding Farmers Communication Networks (IIED Gatekeeper 66), and other related work which can be found on [www.isglink.org](http://www.isglink.org).

|                |                                   |   |
|----------------|-----------------------------------|---|
| <b>Diagram</b> | on understanding particular links | of an actor linkage e.g issues of control and trust between actors. |
|----------------|-----------------------------------|---|

We should stress here that we are not advocating a 'blue print approach' to actor oriented analysis. Rather we would like to share some tools which have been useful to us. These have been used in combination with a range of other research methods: PRA, quantitative surveys, focus group discussions. The type of tool to use and way to use it should be adjusted depending on the context of the analysis and aims of the users.

These tools can be used to analyse large amounts of data collected through a research activity. But equally, they can be useful to guide group discussions based on group members existing knowledge of an innovation system (see discussion of long term versus short term approaches in section 3).

## SECTION 2. TOOLS

### 1. Actor Time Line (see fig 1)

This maps the history of an innovation system looking specifically at significant changes and at the roles of key actors over time. Developing a time line is a useful starting point for an actor oriented analysis. The time line helps to identify who the key actors are, what their role is and has been. It also gives a feeling for the dynamics of an innovation system and where it is currently heading.

#### How to create an actor timeline.

Time lines can be generated through a review of literature, individual interviews (particularly with people with a long association with the innovation system) and group discussions. Usually a combination of all these will get you the fullest information.

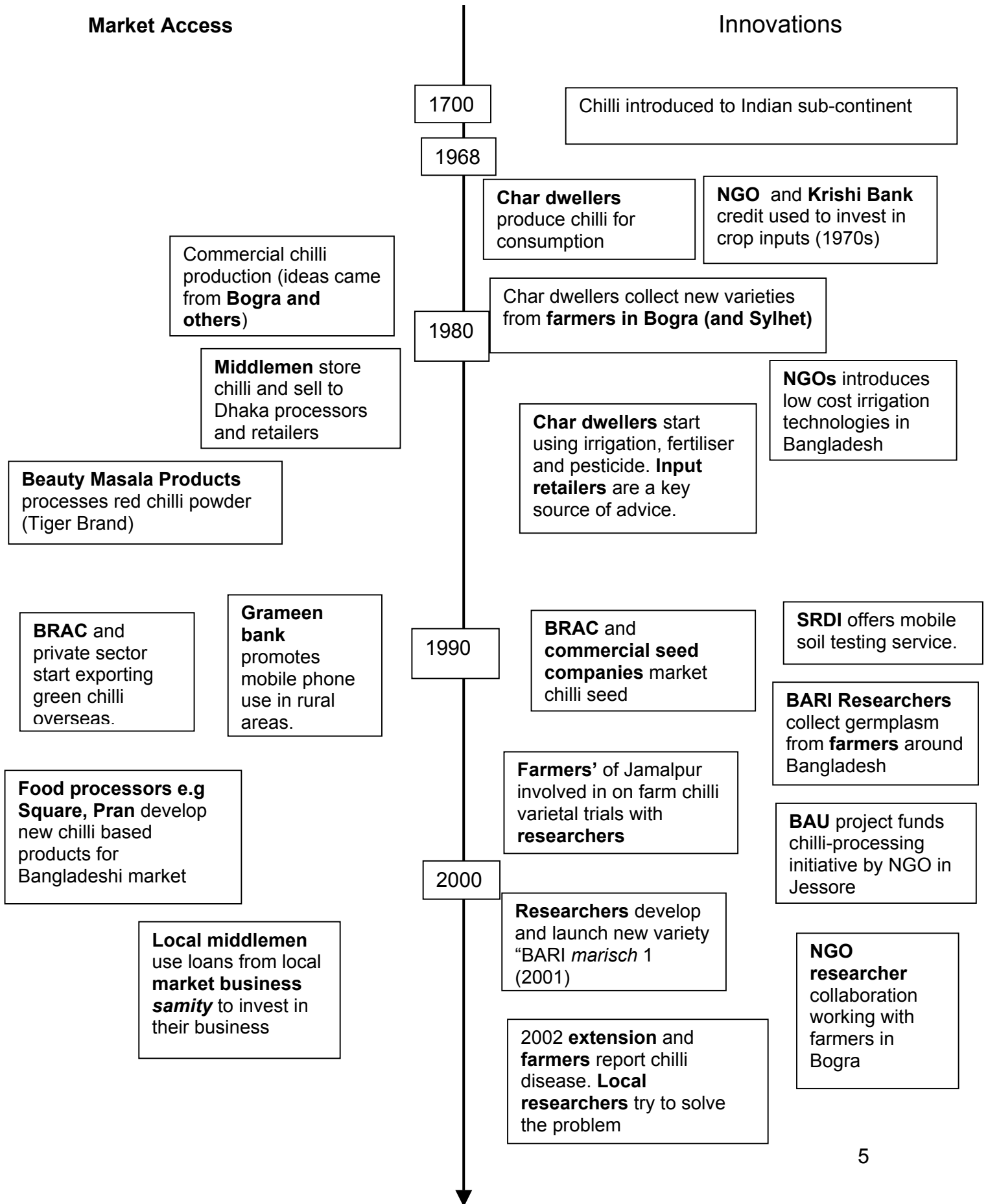
Group discussions with knowledgeable people in the sector are useful to analyse and discuss the implications of the timeline e.g trends and new directions.

For the group discussion, use a flip chart or blackboard.

- Start with the earliest recorded memory in this innovation system e.g in fig 1 the introduction of chilli to the Indian subcontinent.
- Now mark key innovations since that time.
- On the time line these can be linked to key events in local or national history e.g independence, the year of the big flood etc.
- For each innovation marked on the line, note actors who created or helped the spread of this innovation. These are the key actors.
- Discuss implications: how has this innovation system changed? Where is it heading now? Who have been the key actors in the past and present?

- The timeline can be plotted vertically as shown in figure 1, or horizontally (see example in Biggs and Matsuert 2004.)

Figure 1: Time line for Chilli Production in Bangladesh (simplified)



## 2. Actor Linkage Maps (see figures 2 and 3)

This exercise builds on the time line in helping to identify key actors, and goes further in analysing the links between them. 'Ego based' maps can be developed with individual actors to look at who they link with. 'Innovation system' maps are used to combine and synthesise 'ego based' linkage maps, allowing the overall network of links between key actors to be visualised.

Maps can be developed by a group to summarise their knowledge of a key actor or innovation system. In other circumstances maps might be used to summarise the findings of more quantitative data based on interviews or case study monitoring of key actors.

Maps can be used on a wide range of scales. For example you could use a map to look at information flows within an organisation, or to look at links in a regional or national innovation system. One user noted that using a (ego based) map is a good tool to carry out a 'health check' of your organisations linkages.

A different map would be used for a past situation, a current situation and a future scenario situation. Remember the maps of the past and present should reflect actual situations and therefore might look very different from official organisational charts. If it is planned that a new actor is to be brought into the situation, then this actor is added to the map, with planned linkage arrows.

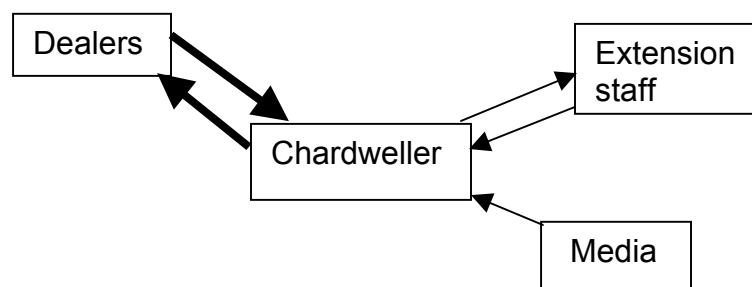
### How to create a linkage map

As with the timeline, maps can be drawn up by one actor or in a group.

#### 1. Ego Based Map

- Put the name of the actor in the centre of the page.
- Ask the actor who they link with for different aspects of their enterprise.
- Use arrows to show direction of flow of information or services.
- Use thick or thin arrows to indicate the importance of the link.

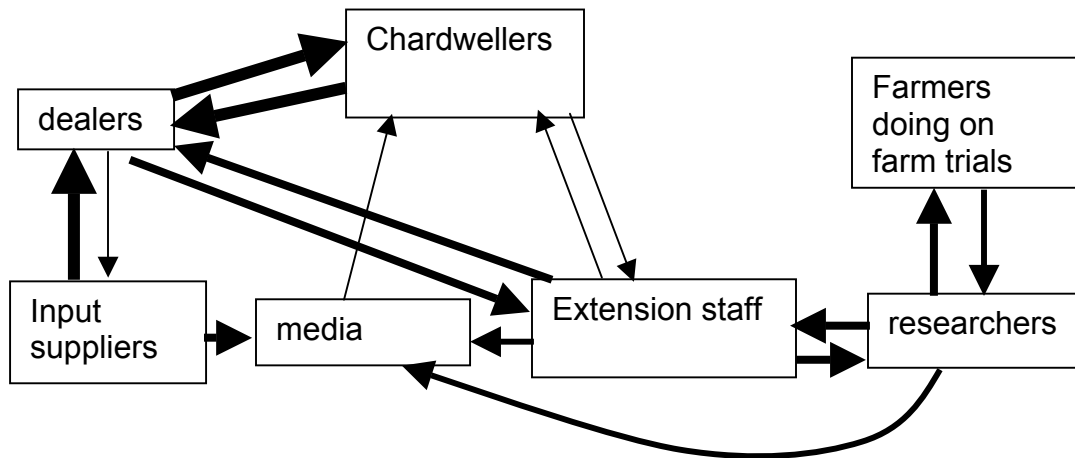
Figure 2: Ego Based Linkage map: Chardwellers links for access to information on chilli production.



#### 2. Innovation System Map

- First list the key actors in the innovation system (from time line exercise and stakeholder analysis).
- Now place the actors around the edge of the paper (or flip chart for group
- For each actor group in turn mark key linkages by using arrows (as described above).

**Figure 3: Actor Linkage Map: Information Flows in Char based Chilli Production (Simplified example.)**



### 3. Actor Linkage Matrix (see figures 4 and 5)

The matrix complements the map. It basically plots the same information as an 'innovation system' map but has the advantage of :

- allowing analysis of more complex systems with many actors (maps get very messy)
- ensuring all possible links between actors are considered, but then allowing you to focus on critical linkages.
- allowing links to be given a value (strong ones and weak ones).

**Figure 4. Actor Linkage Matrix Information Flows in Char based Chilli Production (Simplified example.)**

|   | Actors                       | A             | B                             | C           | D               | E     | F               | G       |
|---|------------------------------|---------------|-------------------------------|-------------|-----------------|-------|-----------------|---------|
|   |                              | Char dwellers | Farmers doing on farm trials. | Researchers | Extension staff | Media | Input suppliers | Dealers |
| 1 | Chardwellers                 |               |                               |             | ✓               |       |                 | ✓✓✓✓    |
| 2 | Farmers doing on farm trials |               |                               | ✓✓          |                 |       |                 |         |
| 3 | Researchers                  |               | ✓✓✓                           |             | ✓✓              | ✓✓    |                 |         |
| 4 | Extension staff              | ✓             |                               |             |                 | ✓✓    |                 | ✓✓      |
| 5 | Media                        | ✓             |                               |             |                 | ✓     |                 |         |
| 6 | Input suppliers              |               |                               |             |                 | ✓✓    |                 |         |
| 7 | Dealers                      | ✓✓✓✓          |                               |             | ✓✓              |       | ✓               |         |

#### How to create a linkage matrix

- Use a spreadsheet programme e.g excel.
- Plot key actors on vertical and horizontal axis
- Now each cell in the matrix represents the flow of information from the actor on the vertical axis to the actor on the horizontal. For example, cell 1D. represents the flow of information from chardwellers to extension staff (in the map this is shown as an arrow). Row 1 represents all the information flowing from chardwellers to others. Column A shows all the information coming from other actors to chardwellers.
- Use symbols or shading to show information flowing from one actor to another. Agreed code and fill in for each actor linkage.

- Each cell in the matrix can be linked to a piece of text describing the linkage and explaining the ranking given.
- As with the actor linkage maps, a separate matrix can be used to represent past, present and possible future situations.
- For planning and monitoring purposes, symbols can be used to indicate linkages which are targeted for interventions or which have been impacted by a particular activity. See figure 4, for a matrix showing an analysis of current links and targeted intervention areas. In this case the interventions were divided into those which built on existing links, those which created new links and those which aimed to change the nature of existing links (e.g changing power relations).

**Variations on the basic matrix:**

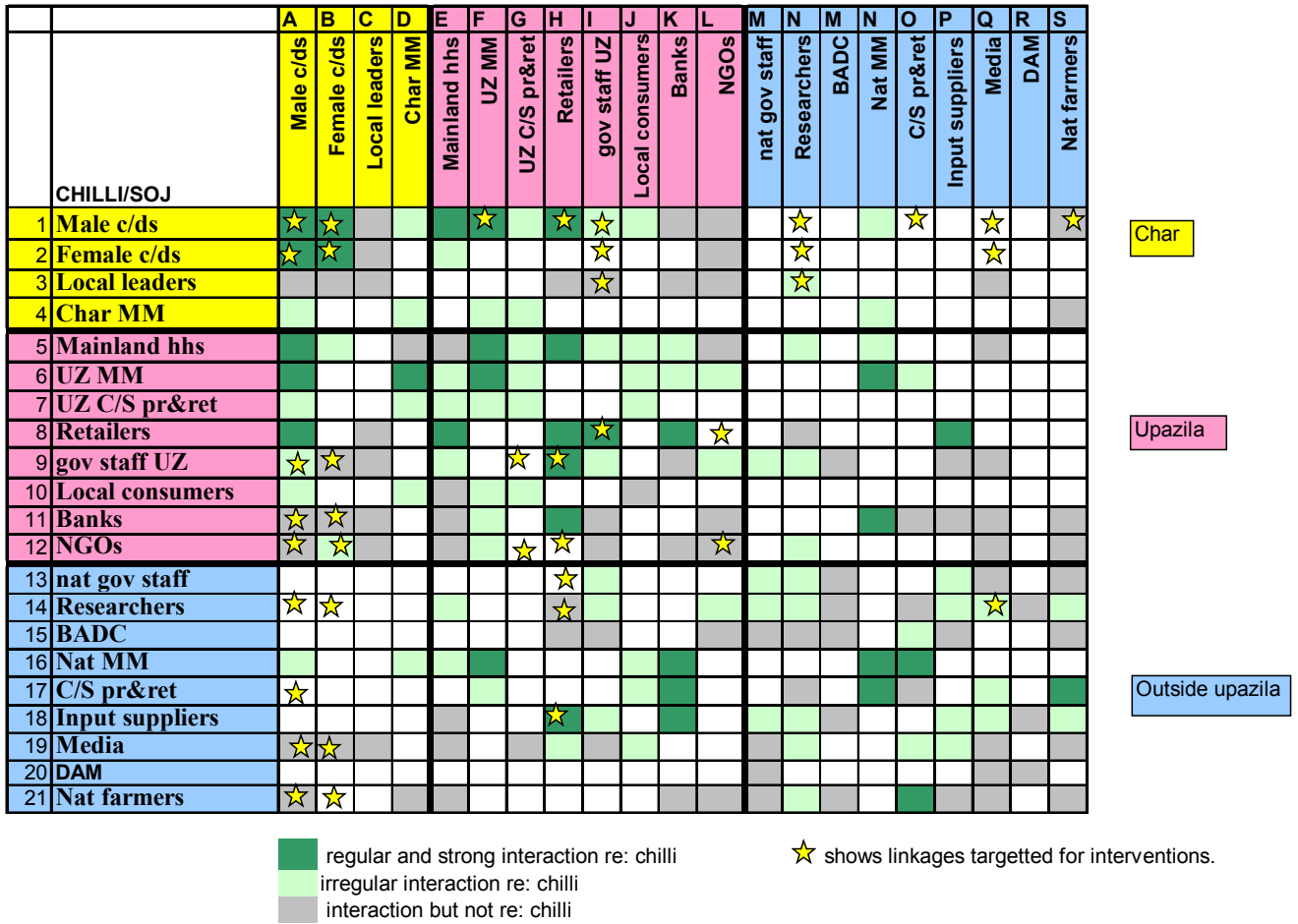
Complex matrix data can be visually represented on maps using the UCINET network analysis software, available free on the internet.<sup>2</sup>

For day to day office use, a **matrix board** can be used to show existing linkages and areas for interventions. This is a matrix drawn onto a board, with hooks in each square on which counters can be hung to represent the strength of a linkage. Coloured counters can be used to indicate targeted areas for intervention.

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<sup>2</sup> Borgatti, S.P., M.G.Everett and L.C. Freeman 1999. UCINET 5.0 Version 1.00 Natick. Analytic Technologies.

**Figure 5**  
**Actor Linkage Matrix on Excel, showing links and planned interventions.**



#### **4. Determinants Diagram (see figure 6)**

This is intended as a group discussion tool to analyse the nature of a particular linkage. The tool encourages the group to explore the strengths and weaknesses of a particular linkage or relationship and to identify ways to build on strengths or overcome problems.

This tool is useful in analysing the quality of a linkage. Maps and matrices, as we have used them, only show the relative strength of relationships and don't give an indication of issues of control, transparency, relative satisfaction with links etc.

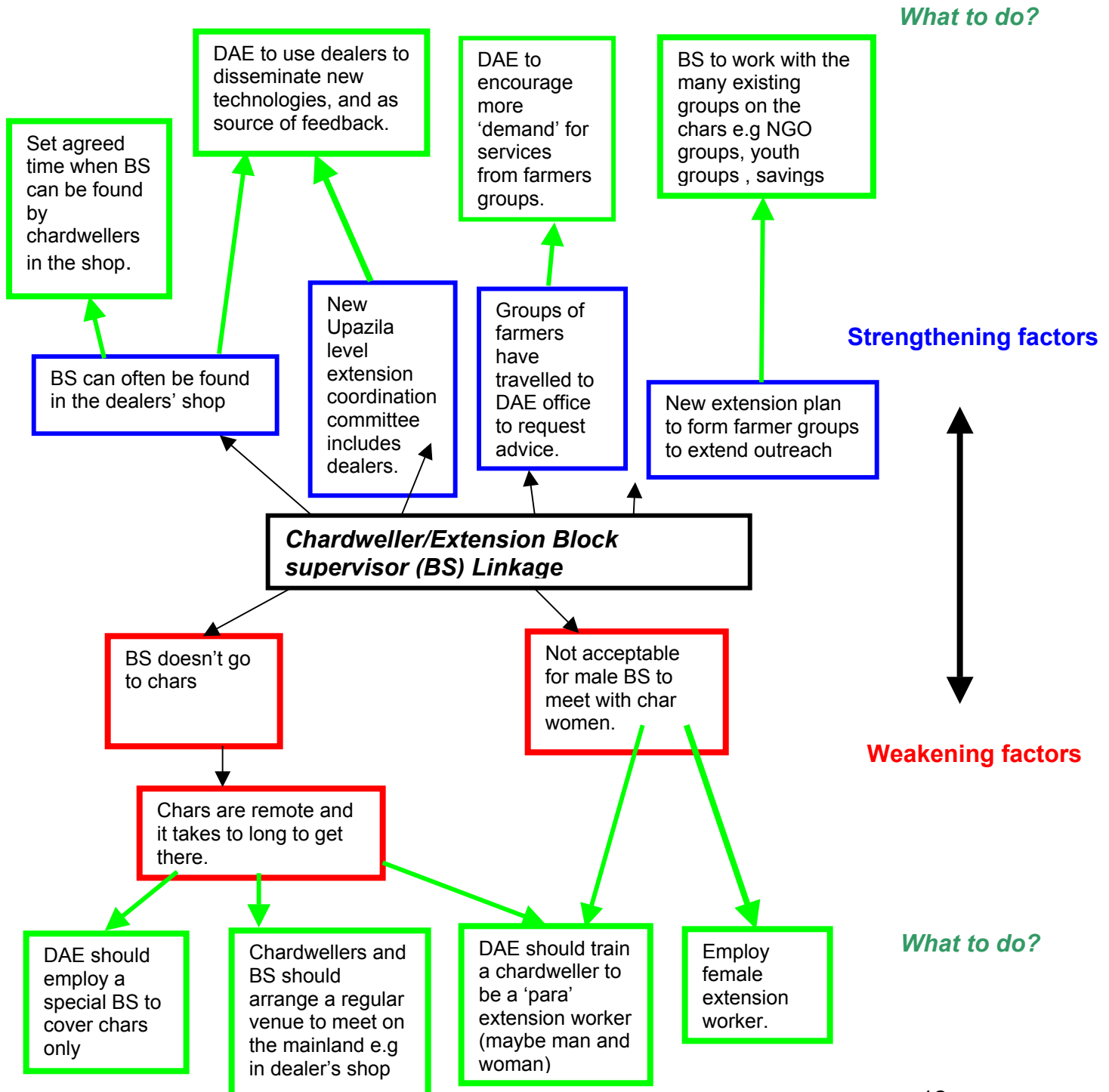
The determinants diagram leads from analysis of a particular situation to the development of action plans. For this reason it is most usefully used with key actors who would be involved in any future implementation of suggested actions.

#### **How to create a determinants diagram**

- Identify linkages on your matrix which look particularly important or significant (perhaps because they are very strong or particularly strategic e.g linking national and local actors). It is not necessary, and would be too time consuming to look at every link in a matrix. The group must decide, using agreed criteria, and based on their particular goals or interests which links to focus on. Occasionally we have combined a group of links (e.g links between chardwellers and a range of national market actors) for discussion.
- Work with groups of actors to look more closely at this link (could be a mixed or single actor group, depending on how well you think the group dynamic will work).
- Write the linkage in the centre of a flip chart. Ask the group to start by discussing the strengths, examples of successful linking, good experiences etc. Mark these in the area above the link (see fig 5).
- Now discuss any problems experienced with this link. Mark these in the area below the link. For each problem, try to get to the root cause, before going on to discuss the next.
- Now for each root cause look for potential solutions. Try to encourage the group to make these active solutions (not things other people should do for them).
- For each strength, look at how this could be built on to further improve this linkage.
- The final result will be a list of ideas for action. Obviously some 'areas for intervention' (what to do) will be more possible to implement than others. The

exercise helps open up a discussion about the feasibility of different actions within the current social and political context.

**Figure 6. Determinants Diagram (simplified)**  
**Exploring the link between extension and chardwellers (currently weak).**



## **SECTION THREE. EXPERIENCE OF USING ACTOR ORIENTED TOOLS IN BANGLADESH**

The research process we used consisted of a number of discrete phases: char based and national surveys, case study monitoring and focus group work. Through all of these we have tried to maintain an actor oriented theme. The tools have been used in a PRA type situation, in individual interviews, group discussions and the approach guided the design of our quantitative household survey.

We have found the actor oriented tools useful, enlightening and productive in the analysis of innovation systems. As we reviewed the methodology, particular strengths observed by the team were:-

- The actor oriented approach is holistic, linking the local, district and national level actors. Other anthropological tools often fail to do this.
- The actor oriented approach is pro poor as actor groups can be disaggregated to focus on different resource levels, gender etc.
- The tools make issues around actor links visible, for example highlighting gaps and showing innovative links.
- As well as being used to map an existing innovation system, we found the tools useful for evaluating individual events (who was linked to who) and for planning interventions.
- The combination of individual case study monitoring and focus group discussions was useful. Individual discussions gave us rich detail and allowed us to discuss sensitive information and to get in depth information. Focus group discussions were useful for cross checking, consensus building and for developing ideas for interventions.
- Participation of actors was very good, particularly in group settings. People enjoyed using the actor oriented tools. They generate much animated discussion.

### **PRA, Household Interviews, Case Study Monitoring, Focus Group discussions. How do approaches complement each other and where are they useful.**

We found that the combination of research styles was very effective. Our initial PRA exercise raised actors awareness of our work and definitely helped build a good working relationship between the coalition team members. However, in the Bangladeshi rural context we found the PRA had some limitations. At the end of the exercise we did not feel we had adequately met our aims of understanding livelihoods and building support for the study. This was due to the problem getting large and representative group meetings because men tended to be absent at work during the day, and women felt constrained from attending a meeting in a public space or in another household's compound. As a result there

was a tendency for meetings to be dominated by one household. This made us unsure of the representativeness of our findings, and made it hard to understand and categorise different household and livelihood types.

In order to get a better understanding of household livelihoods we followed the PRA with a quantitative household survey. In this we visited each household in the two study areas. The survey helped us to get a better feeling for the differentiation between households and to ensure that the case study monitoring stage included a range of household types.

For detailed information and building an understanding of innovation processes, individual case studies were extremely valuable. Building on these, focus group discussion helped us to confirm the relevance of findings, to build consensus on key issues and to take analysis forward into action planning.

In a shorter exercise, actor identification, case studies and focus group work are probably the most critical exercises to get a good picture of actor links in an innovation system.

### **Subsector mapping and Actor Linkage maps: similarities and differences**

In this study we used both subsector mapping and actor oriented maps. Our research team members from BASC frequently use subsector maps when carrying out business analysis. They found that the Actor oriented map gives a different perspective in analysing innovation systems for a number of reasons. See table below.

| <b>Subsector map</b>  | <b>Actor linkage map</b>  |
|---|---|
| Looks at movement of goods in the market chain.                                       | Looks at flows of information and goods. Not only what happens to the product, but how producers get access to information.                             |
| Focuses on economic interactions  | Looks at social and political as well as economic interactions.   |
| Seeks to identify weak points in the existing market chain and ways to support these. | Seeks to identify alternatives to the traditional or mainstream linkages.<br><br>Looks for potential for enhancing system through developing new links. |

Our BASC team members felt that the actor linkage matrix was complementary to the subsector maps, with both having a role to play in project planning. Actor oriented analysis seems to be more suited to situations where there are a wide range of actors, with complementary skills or products, and where there are potential for new innovations to come from building links between these.

## **Long Term versus Short Term Analysis**

In this research project we spent 12 month monitoring the links of our case study actors. This gave us the advantage of being able to identify key events and locations which bring actors together over the agricultural year. A second advantage of a long term analysis phase was that it gave us time to develop relationships and build coalitions with our key actors to take us into the action planning stage.

On the negative side, we had some problems keeping some of our actors interested in what we were doing over a 12 month period. Some, particularly on the private sector side would have liked to have seen us move into action soon.

Most development actors do not have the luxury of a 12 or 18 month project preparation stage. We believe that the actor oriented tools and approach followed here could be carried out over a shorter time period, using one off interviews or case studies and group discussions rather than longitudinal case study monitoring. This would be particularly the case if good relationships with key actors have already been established or by including representatives of key actor groups in the core research team.<sup>3</sup>

## **Political Issues around presenting actor linkage information**

One problem we encountered in our work concerned the political nature of the information revealed by our study. In some cases our findings on links contradicted the 'officially accepted' understanding of how things work. For example, our finding that DAE block supervisors are rarely seen on the char contradicted DAE's image as the ministry which reaches every corner of the country.

Presenting information that contradicts an organisations self image, particularly when, as in this case, it was presented by a small NGO to a large powerful organisations, is very problematic. Our findings were met with hostility and disbelief.

We soon realised that there was a contradiction within our own project aims of

- 1) critically analysing the current institutional environment, and 2) building partnerships to improve it.

As the research project progressed we moved away from 'critical, and judgemental' analysis that might alienate our research and coalition members, turning instead to a more 'appreciative enquiry' approach (see Magruder et al 2001). This does not mean we ignore weak links or pretend they don't exist. However, rather than focusing on them we look instead for positive links and ways forward. For example, looking at the chardweller/ DAE relationship we

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<sup>3</sup> Following the completion of this research project, some members of the research team will be involved in implementing a shorter term study of a business innovation system. This study is being carried out as a pilot for Katalyst, a Bangladesh business development programme.

found cases of farmers actively seeking out the block supervisor or even visiting the DAE upazila office and receiving the advice and services they required. Building on this, and exploring how to develop this (still rare) linkage initiative is more constructive than dwelling on the fact that a low paid government employee, such as a block supervisor, is (and probably will always be) reluctant to make the long and tiresome journey to the chars.

Another change we have made is to move away from 'quantitative valuation of links' which can also give an impression of judgement. Instead we use a colour coded system showing relative strength of links.

We believe that changing the manner in which we approach our analysis does not lessen its effectiveness. In fact it is a more realistic and constructive way of ensuring that our analysis results in changes in the behaviour of key actors, and moves from the theoretical to the practical.

### **Maps and Matrices – how useful are they in visualising and analysing actor links?**

In our research work we found maps to be most useful for group discussions, plotting out links together with actors and for presenting back findings. However maps soon get very complex and web like and its easy to miss particular links. For systematic analysis, ensuring all links are considered and for planning, monitoring and evaluating impact on particular links we found that the actor linkage matrix is a more useful tool.

We have experimented with the use of an actor linkage board<sup>4</sup>, as an alternative to the excel spreadsheet, to make the matrix more accessible for group use, but still find that a group prefers to revert to maps and finds these easier to work with. A matrix board might be useful as an office tool, to be used regularly with a small team to monitor progress in managing links<sup>5</sup>.

During the research period we were introduced to the UCINET software (Borgatti, S.P., M.G.Everett and L.C. Freeman 1999. UCINET 5.0 Version 1.00 Natick. Analytic Technologies). This can be used to translate matrices into maps. The maps can then easily be manipulated to show, for example, only the strongest links, or links for one actor. We've found them an extremely useful complementary tool to the matrix.

One short coming we have found with the map and matrix is the difficulty in representing the 'quality' of a linkage. In our current use, maps and matrices show relative strength of links but cannot express issues such as the balance of power and control in a relationship (though separate arrows and cells do

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<sup>4</sup> This is a matrix drawn onto a board, with hooks in each square on which counters can be hung to represent the strength of a linkage.

<sup>5</sup> DEW plan to use matrix boards in their field office to monitor progress in developing proposed interventions.

represent the direction of information flow). To actually analyse the quality of a link we have found the determinants diagram group discussion exercise very effective. Currently, this analysis is summarised in a text description of key links. It would be interesting to explore ways of visually representing this.

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**Please Contact us:-**

We hope you find this review of actor oriented tools and shared experiences of using the approach useful. If you have any feedback please contact us. We would also be interest in hearing your experience of using this approach.

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For more information on the use of actor oriented tools in our work, please visit our website [www.developmentwheel.org](http://www.developmentwheel.org)