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EXPLORING MECHANISMS FOR PUTTING RESEARCH INTO USE: EVIDENCE FROM RIU'S VALUE CHAIN-ORIENTED PROJECTS IN SOUTH ASIA

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DISCUSSION PAPER SERIES

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EXPLORING MECHANISMS FOR PUTTING RESEARCH INTO USE: EVIDENCE FROM RIU'S VALUE CHAIN-ORIENTED PROJECTS IN SOUTH ASIA[1]

T.S. Vamsidhar Reddy[2], Rasheed Sulaiman V.[3] and Andy Hall[4]

Abstract

The question of how agricultural research can best be used is a topic of some debate in developmental circles. The idea that this is simply a question of better transfer of ideas from research to farmers has been largely discredited. Agricultural innovation is a process that takes a multitude of different forms, and, within this process, agricultural research and expertise are mobilised at different points in time for different purposes. This paper presents and examines the efforts of the DFID-funded Research Into Use (RIU) programme's value chain-oriented projects in South Asia to shed some light on this process and to understand the mechanisms that allow innovation to take place. These cases seem to suggest that the initial stages of a project's trajectory require the creation of a social architecture of actors, which helps articulate demand for specific research and sets the ground conditions for the process of putting research into use. The study also reveals that actors' roles are constantly shifting, becoming more or less important, along the course of a project, depending on the need of the hour. The paper then uses this analysis to derive implications for public policy and its ongoing efforts to add value to research investments.

Key words: Research Into Use, Agricultural Innovation, Value Chain Innovation, South Asia, Innovation Trajectories, Policy

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RIU DISCUSSION PAPER SERIES

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LIST OF ACRONYMS

ADB	-	Asian Development Bank
AFP	-	Adivasi Fisheries Project
AIT	-	Asian Institute of Technology
ARD	-	Agriculture and Rural Development Department, World Bank
BFRI	-	Bangladesh Fisheries Research Institute
CABI	-	Centre for Agricultural Bioscience International
CGIAR	-	Consultative Group on International Agricultural Research
CIP	-	International Potato Center (in its Spanish acronym)
CoDI	-	Coalition to Diversify Incomes through Underutilised Crops
CRT	-	Central Research Team, RIU
DASP	-	Decentralization of Sustainable Aquaculture Project
DFID	-	Department for International Development, UK
DoF	-	Department of Fisheries, Bangladesh
DSP	-	Decentralised (Fish) Seed Production
FAO	-	The United Nations Food and Agriculture Organization
GIFT	-	Genetically Improved Farmed Tilapia
ICLARM	-	International Center for Living Aquatic Resources Management, now renamed WorldFish Centre
ICRISAT	-	International Crops Research Institute for the Semi-Arid Tropics
ICUC	-	International Centre for Underutilised Crops

IDE	-	International Development Enterprises
IDS	-	Institute of Development Studies, University of Sussex
IFPRI	-	International Food Policy Research Institute
INCOPA	-	Project for Potato Innovation and Competitiveness in Peru
LINK	-	Learning INnovation Knowledge
KIT	-	Royal Tropical Institute, Amsterdam
MSU	-	Michigan State University
NFEP	-	Northwest Fisheries Extension Project
NGOs	-	Non-Governmental Organisations
ODA	-	Overseas Development Administration (DFID's predecessor)
PMCA	-	Participatory Market Chain Approach
R&D	-	Research and Development
RAAKS	-	Rapid Appraisal of Agriculture Knowledge Systems
RDRS	-	Rangpur-Dinajpur Rural Services
RIU	-	Research Into Use
RNRRS	-	Renewable Natural Resources Research Strategy
S&T	-	Science and Technology
UK	-	United Kingdom
UN	-	United Nations
USA	-	United States of America
VAPCOL	-	Vasundhara Agri-Horti Producers Company Limited

1. INTRODUCTION

The question of how agricultural research can best be used for developmental purposes is one that is currently being debated in scholarly and development circles, with notions that that this is simply a question of better transfer of ideas from research to farmers being largely discredited (Biggs, 1990). The contemporary understanding of agricultural innovation is that it is a context-specific, embedded process that takes a multitude of different forms, depending on local circumstances and histories, and different challenges and opportunities (Hall et al., 2010). Within this process, agricultural research and expertise are mobilised at different points in time for different purposes in order to achieve sustainable impact (Rajalahti, 2009; World Bank, 2006). An understanding of this innovation process could provide useful lessons for policy and practice on ways of supporting it for wider-scale impact.

There are well founded and differing theories on the agricultural innovation process, ranging from user-led models (Hippel, 1994; Sillitoe, 2006; Ornetzeder and Rohracher, 2006) to researcher-led models. These narratives endorse different configurations of stakeholders and assign different roles for them in the innovation process.

This paper takes the approach that innovation is a path-dependent, contextually-shaped trajectory unfolding over time. We argue that this analytical perspective is important, partially because it reveals the changing role of research during the course of events associated with the development and diffusion of products, services and institutional innovations. However, it is also important to note that the task of putting research into use is not a post-research task, but is a long-term capacity development task concerned with marshalling resources and expertise to deal with an unpredictable and highly dynamic world in which innovation trajectories play out (Reddy et al., 2011).

The paper uses this approach to explore the recent efforts of a donor-funded programme that has been established to explore the agricultural research-into-use question empirically — the

Research Into Use (RIU) programme funded by the UK's Department for International Development (DFID).

It examines the configurations of actors in three of RIU's projects in South Asia in order to understand how these configurations were formed, and the mechanisms and processes that contributed to innovation. The paper concludes that before applying new knowledge, an appropriate and effective architecture — in the form of necessary stakeholders and newly-formed or strengthened linkages between them — needs to be created. This type of 'social engineering' not only creates demand for new knowledge but also gives rise to favourable conditions for putting knowledge into use. The study also points out that different types of agencies take the lead at different stages of the innovation process in order to take the project forward. Actors' roles are constantly shifting, changing and unfolding over the course of the project, becoming more or less important at different stages, depending on perceptions on the ground.

The paper is organised as follows: Section 2 presents a theoretical framework that guides our analysis. Section 3 presents RIU's three value chain-oriented projects in South Asia that provide a backdrop for our study. This is followed by a discussion of the lessons emerging from the case study analysis in Section 4 and while Section 5 rounds up the paper with our conclusions and implications for policy.

2. THEORETICAL FRAMEWORK

In recent years innovation systems conceptualisation of agricultural research and development has revolved on the importance of multi-actor processes and the context in which knowledge generation, dissemination and use takes place (Hall et al., 2004). This highlights the point that technological, institutional and policy innovations are interlinked and, thus, networking different actors in order to facilitate the sharing of ideas and resources is a key strategy for enabling the process of innovation (World Bank, 2006). To support this conceptualisation there is growing evidence to suggest that embedding research in the system of technology users and intermediaries would aid in better use of research products (Hall and Sulaiman, 2008). Barnett (2006) provided evidence for a DFID-funded research programme around the notion that organising research as part of a coalition of development, entrepreneurial and policy actors could improve impacts. Experience has also shown that when organisations with varying expertise network together and start engaging in joint activities, it leads to organisational and institutional changes and enhances application of new knowledge. Moreover, the process also leads to raising new and relevant research questions, as well as triggering new demands for technical support (Hall et al., 2009; Sulaiman et al., 2010).

Innovation can be understood in simple terms as the dynamic process of interaction in specific institutional and policy contexts. In turn this interaction enhances the capacity of the system to identify, adapt and exploit new or old knowledge from its wider environment. (Mytelka and Bortagaray, 2006).

Innovation Trajectories

Unlike many of the analytical instruments from the neo-classical economics tradition the Evolutionary Economic Perspective on Innovation (Nelson and Winter, 1982) — and analytical perspectives aligned to that tradition (notably innovation systems ideas, but also others) — suggests that a sense of history is an integral element of the analysis. The reason for this is that the roles and configurations discussed above evolve over time and play out in an unfolding

innovation trajectory, which responds to various economic, social and policy triggers in the wider environment. This evolution arises partially because organisations involved in innovation continuously learn how to do things better and continuously adapt how they do things because the context they operate in is also constantly changing and they need to respond to this. Path dependence and the unpredictable nature of the shaping environment intersect to produce a limitless range of innovation trajectories.

In addition, as specific products and services are brought into use, different skills, resources and expertise are required at different times in the unfolding performance. Research may be more important at a discovery stage and at a troubleshooting stage when second generation problems occur, but may become less important when diffusion, adaptation and application are taking place. This is not to say that there is a predetermined sequence of events involved in innovation — this would take us right back to end-of-the-pipeline notions of research and technology transfer, which we now know are only effective in a relatively limited set of circumstances. Instead, the analytical insight that comes from exploring innovation trajectories is that it starts to reveal how organisations involved in innovation marshal expertise and resources to meet the challenges of an unpredictable context and how they tackle complex social phenomena, such as poverty, that is itself embedded in its own dynamic context. These concepts, which are now well-founded in the literature, suggest that the task of putting research into use, therefore, does not become a post-research task — an afterthought to make more out of previous research investments. Rather, it suggests that research into use is a capacity building task, where the main organising devices for assistance are not the projects; usually these are conceived as either research or development-oriented and in reality are always administered and implemented in isolation from each other. Instead, contemporary debates would seem to suggest that it is the innovation trajectory itself that is the organising device for putting research into use. The reason for this is that the innovation trajectory is a domain that brings together both research and development activities (the former aimed at discovery and the latter aimed at social and economic gain) in an integrated way.

The paper uses a longitudinal case study methodology to study these cases.

We devote the rest of this paper to exploring three of RIU's projects in Asia, examining the decisions made by the projects' implementers as each initiative infolded, in order to understand the mechanisms and processes that contributed to innovation.

3. RIU'S VALUE CHAIN-ORIENTED PROJECTS IN SOUTH ASIA

Ten years (1995-2006) of research, funded by DFID's Renewable Natural Resources Research Strategy (RNRRS), generated new knowledge in the expectation that it would address the needs of poor communities living in Asia and Sub-Saharan Africa. The final evaluation of the DFID programme suggested that although it had generated "good" scientific research, its developmental impacts have been modest. Subsequently, DFID commissioned the Research into Use (RIU) programme in 2006. The programme's underlying premise was that an additional set of activities beyond research could help extract more impact from earlier investments in research. The ideas informing how this might be achieved have matured considerably from the time RIU was set up to the time of writing this paper. The projects discussed in this paper were set up in the earlier stages of the programme. At that time the guiding principle was about identifying existing technologies and looking for ways of scaling these out. The operationalisation of this principle, on paper at least, built largely on earlier research project thinking and the understanding of this by research teams. As will be illustrated, however, these projects, when examined through the eye of the analytical principles suggested in the previous section, are proving to be a rich source of insights into the organisation of the innovation process over time.

The projects selected for this paper have all focused on innovation associated with value chain development.

The three cases presented in this paper involve RIU projects in South Asia — in Bangladesh, Nepal and India, specifically — that focused on facilitating the wide-scale application of three different knowledge products/ processes developed under DFID's RNRRS programme. Each project has adopted a different approach to putting value chain-oriented knowledge into use. In Nepal the international development agency International Development Enterprises (IDE) has used the Participatory Market Chain Approach (PMCA) to strengthen the vegetable value chain

and connect smallholder farmers to larger markets. In India the Coalition to Diversify Incomes through Underutilised Crops (CoDI), involving the International Centre for Underutilised Crops (ICUC) and a local NGO, BAIF, has built a value chain for underused crops and connected smallholder producers to markets through a multi-pronged approach that was developed by integrating different knowledge products. The project in Bangladesh, led by the NGO Rangpur-Dinajpur Rural Services (RDRS), has been supporting the fish-seed value chain by putting into use the idea of Decentralised (fish) Seed Production (DSP). Table 1 below presents some key features of the three cases.

Table 1. Key Features of the Value Chain-Oriented RIU projects in South Asia

Feature	IDE (Nepal)	RDRS (Bangladesh)	CoDI (India)
Assembly of the cluster of actors	*At programme level:* Key stakeholder representatives, as members of an advisory committee, supervised project implementation *At field level*: Key actors of the existing value chain were brought together through the PMCA approach	*At programme level:* Key stakeholder representatives, working as part of a loose network, supported project implementation *At field level:* Value chain developed by creating new roles and strengthening linkages among existing actors	*At program level*: Key stakeholder representatives, organised into a coalition, were involved in programme implementation *At field level:* A multi-pronged approach brought together different actors along the agricultural value chain to build a value chain around underutilised crops
Approaches/ strategies for putting existing knowledge from RNRRS into use	Proven knowledge was adapted and adopted in a different context for innovation around value chains	Proven knowledge was scaled-up/out in a larger area through innovation around value chains	Different streams of knowledge were appropriately mixed to continuously develop an approach for value chain innovations
Mechanisms/ strategies for integration of research into the innovation process	Smallholder organisations were capacitated to articulate their need for research outputs to research agencies	Research organisations were part of the network and there was two-way feedback and information sharing	Research organisations were part of the coalition and there was two-way feedback and information sharing
Features and	Focus on building	Focus on developing	Focus on vegetables and

ways of making the effort pro-poor	capacities of smallholder organisations	smallholder rice field farmers and seasonal pond owners as producers of fish seed	fruit that are mostly cultivated by smallholder farmers on degraded lands
Commodity in consideration	Mainstream fruit and vegetables	Fresh water fish species that are self-recruiting	Underused crops (cereals, fruits and vegetables)
Status of the existing value chain (prior to the RIU intervention)	Mostly present but with inefficiencies and missing links	Mostly present but with inefficiencies	Mostly absent
Intervention in the value chain	Building capacity of smallholder organisations to identify and respond to market opportunities. Building linkages among different components of the existing value chain	Creating a role for smallholder farmers in the fish seed value chain and strengthening linkages among existing components of the fish-seed value chain	Simultaneously building different components of the value chain. Allowing existing components of the value chain to join in, in accordance with their individual business interests

What follows in the next section is an analysis of these three cases and key findings.

4. KEY FINDINGS AND DISCUSSION

A detailed analysis of the cases studied for the purpose of this paper provides interesting insights into the agricultural innovation process. What follows are the key findings, each followed by a detailed presentation of aspects of the cases they are inferred from.

I. The initial stages of the innovation trajectory involve developing appropriate configurations of agencies. The need for new knowledge arises at later stages.

The three case studies clearly indicate that before applying new knowledge, an appropriate and effective architecture — in the form of necessary stakeholders and newly-formed or strengthened linkages between them — needs to be created. This type of 'social engineering' not only creates demand for new knowledge but also gives rise to favourable conditions for putting knowledge into use. This is probably because putting knowledge into use is itself a social process in which different types of agencies play specific roles during different stages. Interactions among them are key to this process.

The case histories presented below show how a gradual process of stakeholder interaction and linkage creation resulted in demand for newer knowledge.

i) *Application of the Participatory Market Chain Approach in Nepal*

This project — which is all about connecting smallholder vegetable growers to larger markets and other service providers by building configurations of relevant actors in Nepal — is led by IDE Nepal, an NGO that is well-known for its unique market-oriented approaches to rural development. IDE Nepal's long-term efforts — of building actor architectures of smallholder vegetable grower groups and connecting them to different agencies and service providers in order to enable better access to markets — received a boost through RIU, under which it adapted and applied the Participatory Market Chain Approach (PMCA) to move these actor architectures to a higher level of operations.

Since the early 1990s IDE's key activities have involved participatory research to develop and provide appropriate micro-irrigation technologies in Nepal, such as drip systems, micro sprinklers, treadle pumps (manual foot pumps), and water storage/ distribution technologies. Over the years it has developed trusting relationships with farmers and rural communities. Later, based on demand, it expanded its product portfolio to provide equipment for agricultural production and processing, including developing and providing appropriate agricultural equipment for coffee processing, essential oil distillation and for a variety of other high value sub-sectors such as spices/herbs, non-timber forest products, livestock, and fisheries. It was through these activities that IDE began to recognise the opportunities for smallholder farmers to rapidly increase their incomes by supplying agricultural produce, especially vegetables, to larger national and international markets. However, it soon realised these opportunities was not going to be easy, given that farmers were unorganised and produced only small quantities of vegetables — compounded by the problem of inefficiency in the existing value chains characterised by missing actors and insufficient connections between existing ones (See Figure 1)

In order to address these constraints and connect farmers to markets, IDE facilitated[5] the construction of community managed collection centres at various district blocks, which served as points of accumulation of vegetables to attract local traders. Individual farmers were organised into farmer groups, supervised by the block collection centre. IDE also appointed an executive body for each centre, called the Marketing and Planning Committee, to represent the interests of members to different stakeholders. Input dealers who operated in various regions were given resource books on crop production practices and were encouraged to share copies of these with their farmer clients at a nominal cost. These input dealers were also encouraged to attend meetings at the collection centres. The Marketing and Planning Committees were trained and encouraged to contact the Department of Agriculture and village development committees at the local level to access various programmes and funding schemes. IDE also

[5] Facilitation involved conceptualisation of the idea, encouraging communities, troubleshooting, and mobilising financial resources and necessary policy support.

registered the farmer groups it formed with the Department of Agriculture and the marketing and planning committees under the Cooperatives Act in order to formalise and institutionalise these organisational structures and ensure their sustainability.

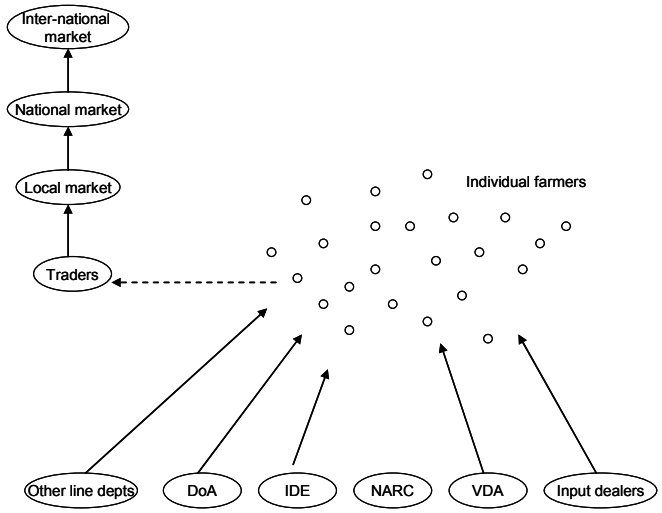
This creation of social architectures[6] — under IDE's Rural Prosperity Initiative and Smallholder Irrigation Market Initiative — helped farmers receive better prices, mainly because the marketing and planning committees were able to use their bargaining capabilities for the produce at the collection centres. However, despite all efforts, there still existed an element of mistrust between farmers and traders. This translated into traders not openly sharing prices, farmers complaining about exploitation by traders and traders complaining about the lack of regularity in supplies from farmers. The marketing and planning committees lacked the requisite skills to address these issues at the time. The linkages among different agencies that IDE created through the collection centres remained structural but not functional. As a result, the impacts of these interventions were not as high as expectations.

At this stage, IDE felt PMCA could be a useful tool to address these problems and move current initiatives to the next level of market operation. IDE expected the tool to help them in building management capacities in the marketing and planning committees that would help them respond to different types of market opportunities and try and build trust among different agencies. Given that PMCA was originally developed in a completely different geo-political-cultural-market context, IDE decided to adapt it to the local context. For this, it collaborated with PMCA's developers to understand the tool's conceptual underpinnings. While sticking to the broad framework, IDE customised the different activities to be undertaken under each of the three stages of the approach. The thematic groups suggested in the approach were promoted as mechanisms for different agencies to come together to discuss and jointly plan initiatives. The social architectures established under IDE's previous initiatives were used as starting points to apply the PMCA approach.

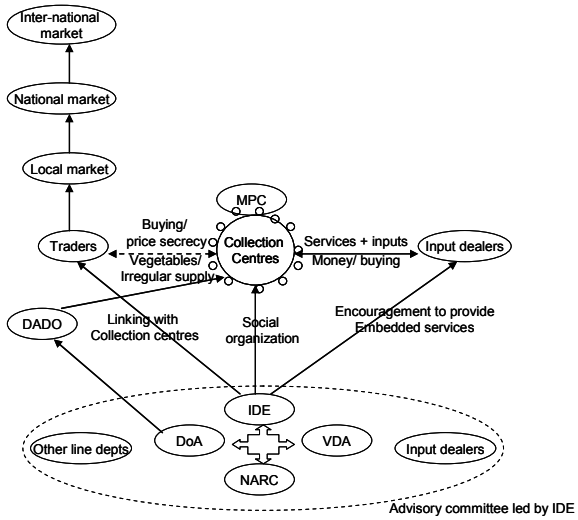
[6] The 'creation of social architectures' here refers to the activity of bringing relevant agencies together and developing/ strengthening functional relationships among them.

Discussions with different agencies associated with this initiative clearly showed that the foundation laid earlier in terms of organising farmers and establishing linkages among different agencies created the demand for PMCA and paved the way for employing it and, thus, benefiting from it. Encouraged by the results, the initiative's advisory committee, with the director general of the Department of Agriculture as its chairman, appointed a task force to study how PMCA could be adopted by in other parts of the country. Figure 1 below presents different stages of the intervention.

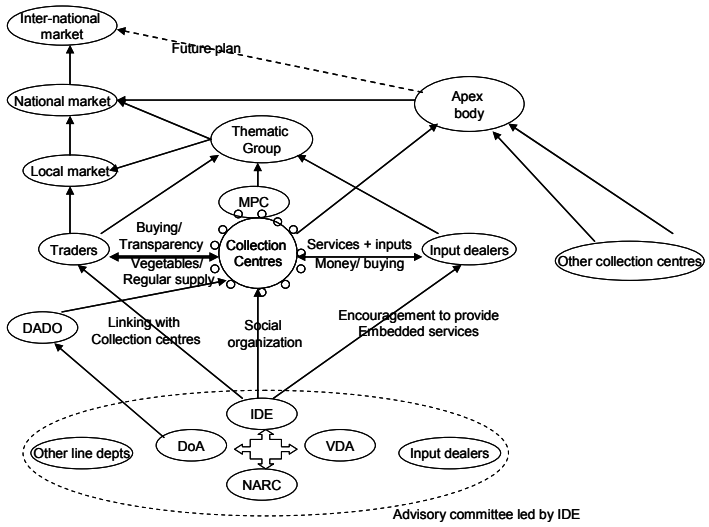
Figure 1. Different Stages of Stakeholder Architecture in Promoting PMCA



Situation 1: Relevant actors and their relationships — Starting conditions



Situation 2: Relevant actors and their relationships — Institutional architecture created through other initiatives before introducing PMCA



Situation 3: Relevant actors and their relationships — PMCA introduced and relationships promoted to the next level

ii) Application of Decentralised Seed Production (DSP) in Bangladesh

This RIU project in Bangladesh is focused on setting up a decentralised, micro enterprise-based supply network to supply fingerlings of an improved breed of tilapia[7], using an approach referred to as Decentralised Seed Production (DSP). The project is led by Rangpur Dinajpur Rural Service (RDRS), a well-established and well-respected NGO based in northwest Bangladesh — an area of heightened rural poverty where integrated fish and rice production systems are key livelihood strategies. RDRS leads a consortium of organisations in the initiative, including NGOs such as PROVA, SACHETAN, ACD and Practical Action, as well as strategic partners such as IDE-Bangladesh (for its market development expertise), WorldFish Centre (for its technical expertise and the Department of Fisheries (for its technical mandate). The project builds on an extensive history of research and development activities in Bangladesh and internationally.

Several largely un-connected efforts appear to have contributed to the development of the DSP approach. One stream of efforts was first launched in 1991 by a project called Northwest Fisheries Extension Project (NFEP)[8] in northwest Bangladesh. The research-oriented staff of

[7] The project refers to this as fish seed.

[8] The Northwest Fishers Extension Project (NFEP) was supported by DFID in two phases during 1988-2000. The regional focus was the impoverished Northwest region of Bangladesh. NFEP trained and used more than 1,000 fish seed traders and more

NFEP attempted decentralised common carp seed production through the collection and translocation of spawn deposited by annual floods on aquatic plants in household ponds and ditches to rice fields. The encouraging results of this initiative prompted the Integrated Rice Fish (InterFish) Project[9] to promote fish cultivation in rice fields as part of efforts at Integrated Pest Management (fish eat pest larvae). In this early stage efforts were limited to common carp. This, however, changed with the introduction of GIFT (Genetically Improved Farmed Tilapia), which had originally been developed by ICLARM (International Center for Living Aquatics Resource Management)/ World Fish in collaboration with several research and development agencies[10]. Asian Development Bank (ADB) also helped the Bangladesh Fisheries Research Institute (BFRI) to introduce GIFT in 1994, as part of a project on "dissemination and evaluation of genetically-improved tilapia in Asia". The Go-Interfish project, implemented by CARE during 2000-2005, also further promoted the production of common carp and GIFT in rice-field plots.

Another stream of efforts that contributed to the development of DSP was the result of collaboration between the Asian Institute of Technology (AIT), Worldfish Centre (a CGIAR centre) and the Institute of Aquaculture in the University of Stirling, UK. Financial support for these initiatives came largely from the UK's Overseas Development Administration (ODA, the predecessor to DFID) through its RNRRS programme and the Asian Development Bank. These partners worked with national government departments and NGOs to advance technical aspects of developing appropriate hatchery systems for low-cost, freshwater fish. As a result, technologies for tilapia (in both commercial and smallholder situations), small carp and snakeskin gourami[11] were developed or refined. The RNRRS project, "Aquaculture Outreach project", promoted improved availability of quality fish seed to farmers and explored different approaches to suit different conditions. As a result of these efforts, greater numbers of farmers

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than 250 secondary school teachers as extension agents. It established more than 200 model villages where more than 9,000 farmers received training in aquaculture.

[9] The InterFish Project was implemented by the Cooperative American Relief for Everywhere (CARE) with financial support from DFID.

[10] Research efforts to develop GIFT were initiated in 1988 through a collaborative initiative involving ICLARM, the Institute of Aquaculture Research of Norway (AKVAFORSK) and three organizations from the Philippines: the Freshwater Aquaculture Centre of Central Luzon State University, the Marine Science Institute of the University of the Philippines and the Bureau of Fisheries and Aquatic Resources.

[11] A type of fish with the biological name ***Trichopodus pectoralis***

began to produce greater and more improved quantities of seed. Subsequently, a research project on "improving fresh water seed supply and performance in smallholder aquatic systems in Asia" (funded by DFID through its RNRRS strategy, R-7052) clarified many earlier perceptions and further advanced knowledge about freshwater fish seed production in Asia. The DSP approach, therefore, evolved by building on knowledge from these different research and development efforts.

Freshwater aquaculture is very important to the livelihoods of villagers in northwest Bangladesh. Good quality fish seed is critical for the success of freshwater aquaculture. Although there are many public and private sector hatcheries, these exist in clusters and are distantly located. Poor transport facilities (fish seed is usually transported by seedling traders or '*patheelwalas'* in metal pots tied to bicycles) and longer distances result in higher mortality and transportation costs. Monsoon-dependent farming in these areas results in higher demand and higher costs of fish-seed during peak seasons. All these factors act as serious constraints for smallholder farmers when it comes to accessing good quality fish seed. To address these issues, decentralised fish-fingerling production in rice fields by farmers was suggested as an option, after establishing its feasibility through the efforts mentioned above.

Several attempts were made to popularise this decentralised approach by agencies such as the Department of Fisheries (DoF), Bangladesh Fisheries Research Institute (BFRI), WorldFish and several NGOs. These included special projects such as the Decentralization of Sustainable Aquaculture Project (DASP)[12] and the Adivasi Fisheries Project (AFP)[13], which demonstrated the usefulness of this approach to farmers — through campaigning on the radio and television and by the efforts of NGOs such as RDRS. Individual farmers who participated directly in these efforts continued to grow fish seed in their rice fields. However, the approach was not taken up widely. The main reason for this was the lack of an appropriate supply chain and support

[12] Implemented by WorldFish in collaboration with about 40 NGOs throughout Bangladesh during 2000-2006. Activities focused on creating awareness and training NGO staff on DSP.

[13] WorldFish promoted DSP with common carp, GIFT and carp in rice fields through its Adivasi Fisheries Project in the northwest (Rangpur, Dinajpur and Jaypurhat districts) and the north (Sherpur and Netrokona districts) in Bangladesh.

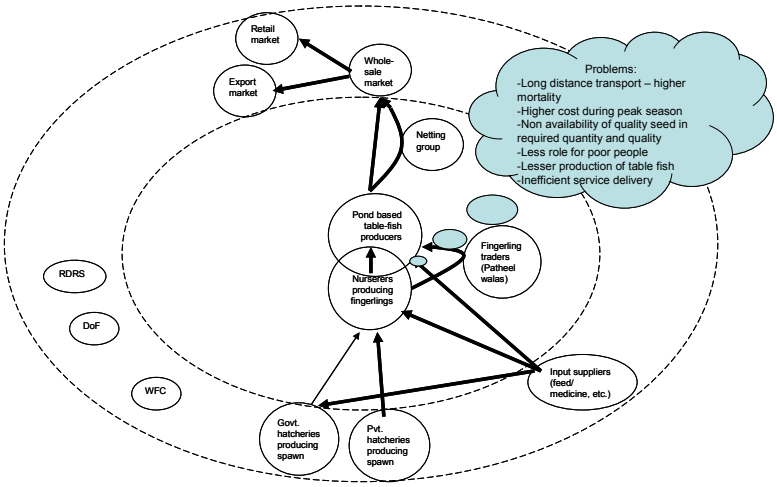
services — to ensure regular supply of GIFT fingerlings, to provide necessary technical knowledge and to purchase multiplied fingerlings (See Figure 2).

It was at this point that support from RIU entered the picture. To address the constraints discussed above, RDRS led a consortium of NGOs from the northwest to collaborate with partners with specific expertise. These included IDE Bangladesh (International Development Enterprises) for its market development expertise, WorldFish Centre for its technical expertise and the Bangladesh Department of Fisheries for its technical advisory mandate. The consortium built the necessary actor architecture to apply the DSP approach. Rice field farmers, table fish farmers, seasonal pond owners, and fingerling traders were selected and encouraged to be part of the initiative. Roles to be played by each were specified and interactions among them facilitated. Farmers and traders were supported with necessary training and finance. A few selected table fish growers (pond owners) in different regions were encouraged to play the role of 'satellite brood rearers' (suppliers of GIFT brood fish to interested rice field farmers). A number of educated and unemployed youth from local areas were selected and trained to play the role of field technicians to provide motivation and technical knowledge, and clarify any doubts farmers interested in DSP may have had. WorldFish representatives and personnel from the Department of Fisheries helped these field technicians through technical backstopping. IDE, which has extensive expertise in developing rural markets, designed and implemented locally-specific activities to develop markets for fingerlings and build relationships among different actors along the fish seed supply chain. The Department of Fisheries promoted and managed a "brood bank" to ensure a sustainable supply of brood stock to satellite brood rearers. Some individuals — selected from fingerling traders, rice field farmers and table fish growers — were promoted as 'local entrepreneurs' and were provided with necessary knowledge and skills to promote the DSP concept, benefiting in the process through increased business. Many locally-relevant ideas were implemented with regards to the composition of fish species to be cultivated, size of the ditch and bunds in the rice fields, feeding patterns, ensured water supply during dry seasons, etc. The tacit knowledge of different functionaries (including field

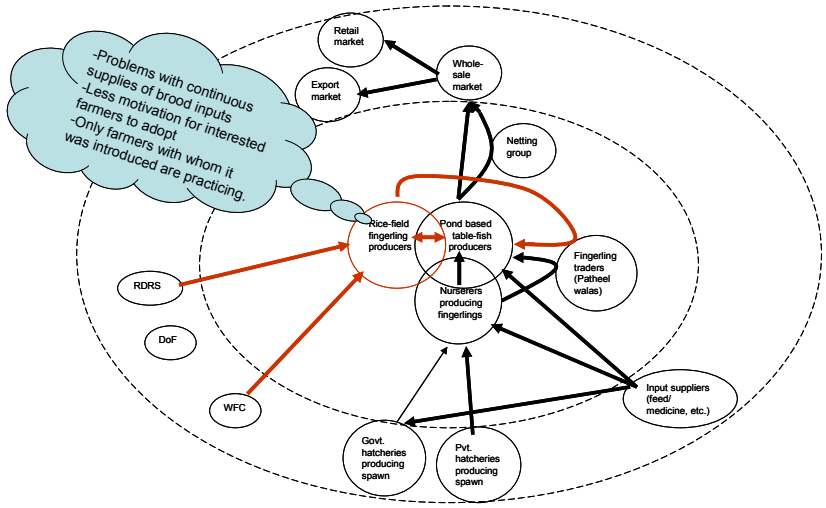
technicians, rice field farmers, satellite brood rearers, fingerling traders, nursery owners, DoF officials, NGO staff, etc.) was utilised for devising these approaches.

What is important to note at this point is that the resources of RIU were mainly used by the project to help bring in partners to an initiative that had, in many senses and in many different forms, been in operation for more than 10 years. The main feature of what the partners actually used RIU resources for was to improve the scope and quality of relationships and attendant processes necessary for innovation. In this case the innovation was a marketing and institutional innovation that allowed poor farmers to access and benefit from improved fish breeds. It is also important to realise that RIU provided no recipe for how these processes should be managed; this was left to the resourcefulness of the partners involved. A critical element of this was the identification of skill sets required to address emerging issues. For example, the project struggled initially as RDRS had little marketing expertise. This was resolved by bringing in IDE, which has a strong track record in setting up marketing systems for the poor. This meant that the patterns of partnership evolved considerably as the innovation trajectory of DSP unfolded (see Figure 2).

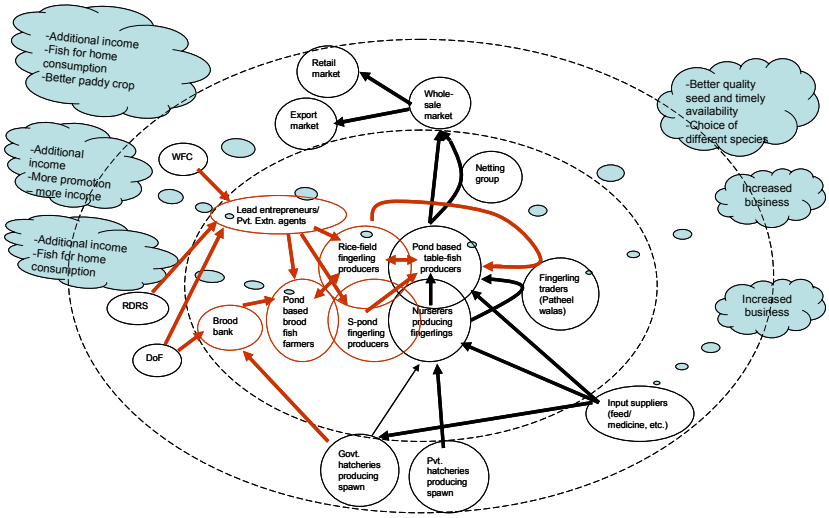
Figure 2. Different Stages of Stakeholder Architecture in Promotion of DSP



Situation 1: Relevant actors and their relationships – Starting conditions in the innovation trajectory



Situation 2: Relevant actors and their relationships – DSP introduced in individual farmers' fields



Situation 3: Relevant actors and their relationships – DSP introduced by creating appropriate architecture of stakeholders

iii) Application of a Multi-Pronged Approach to Promote Underused Crops

This RIU project focused on creating actor architectures to develop a value chain for underused crops in India. The International Centre for Underutilised Crops (ICUC) collaborated with a reputed national NGO, BAIF, to achieve this by developing a multi-pronged approach based on several knowledge components that were each successfully tried in different contexts.

The multi-pronged approach used by the RIU initiative appears to have emerged from several independent research efforts and experiences. The International Centre for Underutilised Crops (ICUC) led one group of such efforts, which initially focused on collating local and scientific knowledge on production and post-harvest aspects of underused crops from the extension literature and promoting the wider dissemination of this material. ICUC collaborated with many research and implementing partners in these efforts. Through projects such as the 'Fruits for the Future Programme' (an RNRRS initiative – R7187), it worked with national research institutes and developmental partners to produce extension literature and organised training programmes to disseminate this. ICUC also realised that simply making this knowledge available addressed only one aspect of the problem. There were other constraints to promoting underused crops, such as the lack of free access to plant propagation material of required species; unavailability of post-harvest and processing technologies; and lack of linkages to markets and other service providers. Thus, ICUC began to realise the need for broader engagement with diverse stakeholders.

Based on these lessons, ICUC subsequently implemented a project on "Improved livelihoods through the development of small-scale fruit processing enterprises in Asia" (an RNRRS initiative – R8399), in which capacities of local partners were built in the production and processing of underused crops through training and financial support. These local partners were then expected to identify, encourage and support potential entrepreneurs to set up production and processing facilities, so that producers of underused crops could benefit from these. In India, BAIF, which was ICUC's local partner, established three fruit processing facilities — 'resource centres' — through self help groups of small entrepreneurs. However, these fruit

processing enterprises collapsed despite some initial success. This was mainly because of the lack of business skills among these small entrepreneurs, which could have enabled them to access credit facilities, markets and raw material. The lessons from these earlier efforts formed the basis of efforts to develop a multi-pronged approach to address all aspects of the problem.

The BAIF Development Research Foundation has more than four decades of experience, starting in the late 1980s, in the production and use of underused crops to support rural livelihoods. Together with collaborative activities with agencies, such as the Oxford Forestry Institute, to identify suitable hardwood species for fodder and fuel needs of rural communities, BAIF has implemented large-scale initiatives, such as the *Wadi* programme[14]. As part of this initiative BAIF promoted the cultivation of mango (*Mangifera indica*), cashew (*Anacardium occidentale*), guava (*Psidium guajava*), custard apple (*Annona squamosa*), amla (*Emblica officinalis*), lemon (*Citrus spp.*), sapota (*Manikara zapota*), drumstick (*Moringa oleifera*), tamarind (*Tamarindus indica*) and bael (*Aegle marmelos*). Of these, tamarind, bael, fruit part of cashew, etc., all widely considered as underused crops.

Recognising BAIF's expertise in the area, ICUC embarked upon a collaborative initiative on research around underused crops. The initiative focused on participatory surveys, agronomic trials on production and post-harvest technologies and publishing extension literature in local languages. It also participated in regional networks such as the Underutilized Tropical Fruits in Asia Network (UTFANET), representing diverse agencies from the research and development sectors, to promote knowledge and information on underused crops. Through programmes such as the Fruits for the Future Programme (1998-2001), the initiative worked with local research and development organisations to conduct training programmes for farmers and NGOs on production and post-harvest aspects of underused crops. At this stage the general assumption appeared to be that collating and disseminating knowledge about producing and processing underused crops was sufficient to ensure putting that knowledge into use.

[14] BAIF launched the *Wadi* programme in the Valsad district of south Gujarat in the late 1980s. The programme was aimed at promoting agri-horti-forestry plots on degraded lands belonging to resource-poor villagers. The success of the programme in the area encouraged BAIF to promote it in six states, covering about 0.1 million families and 40,000 hectares.

However, significantly, at this point the initiative began to realise that making knowledge available addressed only one aspect of the problem and there were other constraints to promoting underused crops, including the lack of free access to plant propagation material of required species; non-availability of post-harvest and processing technologies; and lack of linkages to markets and other service providers. This realisation was backed by evidence from ICUC's previous research efforts (Haq, 2000; Haq and Hughes, 2002). and those of others shared at a regional consultation meeting.

To address the problems in production and use of underused crops, a multi-stakeholder group called the Coalition to Diversify Incomes through Underused Crops (CoDI) was formed, comprising representatives from different organisations. The coalition developed a multi-pronged approach by putting together knowledge generated from various research and developmental initiatives.

The multi-pronged approach essentially comprised three components: Community Germplasm Orchards, Village Crop Fairs and Fruit Processing Parks. The orchards were organisational structures created to multiply plant material to be supplied to interested growers. Necessary training and financial support was provided to each orchard team. The crop fairs were events where different agencies could come together to share lessons and interests about underused crops. The processing parks were places where all the necessary facilities/ resources concerning post-harvest activities and marketing of underused crops could be accessed. This approach was implemented in areas where BAIF's *Wadi* programme had already created the necessary social architecture and linkages among relevant agencies, and complemented this earlier initiative. Underused crops were added to the existing *Wadi* agri-horti-foresty plots, while the orchards and processing park facilities helped both initiatives to benefit. Linkages established with universities and research stations helped extend technical support for underused crops while the market channels established helped promote these crops. BAIF, which was anchoring the adoption of this approach, played a central role by bringing relevant actors — such as technical

experts, market players and community members — together to promote underused crops. CoDI made several adjustments to the approach during the implementation stage, based on feedback after the first round of activities, in order to meet specific local requirements.

II. *Different agencies play different roles at d*ifferent Stages of *the i*nnovation *t*rajectory

These cases seem to indicate that different types of agencies assume lead roles at different stages of the innovation trajectory. These lead agencies enact individual roles expected of them while embedded in appropriate configurations of stakeholders. However, there is no formal transfer of responsibilities and it is a continuous process of knowledge generation, adoption and wide-scale promotion. Along the way, knowledge gets refined, further developed, adapted to fit to specific situations and then gets adopted.

A. Research Agencies tend to lead the Knowledge Development Stage

The three RIU cases demonstrate that an earlier stage of an initiative, much before it takes off in the field, research organisations tend to take on the lead role in developing the approach that will guide the way the project is implemented.

i) Developing the PMCA Approach

The origins of PMCA can be traced to the efforts of Papa Andina, a regional programme initiative by the International Potato Centre (CIP) with activities spread out in Bolivia, Ecuador and Peru. Started in 1998, with the aim of improving the livelihoods of low-income potato farmers in the region, Papa Andina's initial activities were focused on improving production through technological solutions. When marketing problems began to impinge upon improvements in production, the programme team began to explore ways to enhance the participation of smallholder farmers in market chains (Horton et al., 2009). To achieve this it worked with another CIP initiative — the Project for Potato Innovation and Competitiveness in Peru (INCOPA) — and used the Rapid Appraisal of Agriculture Knowledge Systems (RAAKS) methodology (Engel and Salomon, 2003) together with other participatory approaches. These efforts gradually evolved into a new approach called PMCA (Horton et. al., 2009). The approach

helped the initiative improve relationships among market chain actors and R&D professionals and triggered the development of new products. Over the years, PMCA has been further developed and documented, based on work in Bolivia and Peru (Devaux et al., 2009).

ii) Developing the DSP approach

Parallel streams of knowledge development — one anchored by a research-oriented development project and the other by researchers collaborating with a development programme — contributed to the development of the DSP approach (refer to the earlier project description for more details).

Efforts by researchers — Research efforts of a collaboration of Asian Institute of Technology (AIT), WorldFish Centre, Institute of Aquaculture of the University of Sterling, UK worked working with local government departments and NGOs — to advance the technical aspects of developing an appropriate hatchery system for low cost freshwater fish resulted . As a result, in technologies for tilapias (both in both commercial and small-holder situations), small carps and snakeskin gourami were being developed or refined. Researchers Through their Aquaculture Outreach project, they promoted improved varieties of availability of quality fish seed among for farmers and explored different approaches to suit different conditions. Researchers also began to appreciate the involvement and inputs of farmers in seed production, which helped them clarify many perceptions and advance knowledge about freshwater fish seed production in Asia.

iii) Developing the multi-pronged approach to promote underused crops

The knowledge base that resulted in the development of the multi-pronged approach to promote underused crops seems to have come from many independent research efforts. One group of efforts, led by ICUC, initially focused on collating local and scientific knowledge on production and post harvest aspects of underused crops, producing extension literature and promoting wider dissemination of this material. It also participated in regional networks such as the Underutilized Tropical Fruits in Asia Network (UTFANET) and Southern and East Africa

Network for Underutilized Crops (SEANEU). However, it soon realised that making knowledge available did not address constraints such as lack of free access to plant propagation material of required species; non-availability of post-harvest and processing technologies; and lack of linkages to markets and other service providers. Through trial and error, and collaborating with several partners, including BAIF, researchers developed a multi-pronged approach to address all aspects of the problem.

B. The implementing agencies of a project in the field tend to lead the knowledge adoption stage

Once a project decides on the approach it needs to adopt to carry the initiative forward, certain stakeholders, including development agencies and civil society actors, take the lead in the field in putting the approach into practice.

i) Putting PMCA into use

PMCA was originally developed in a completely different geo-political-cultural-market context than Nepal and for a different commodity. IDE-Nepal had to adapt it to local context. It first collaborated with the approach's original developers to understand the conceptual underpinnings of the methodology. In doing so IDE realised that the three stages of the approach could provide opportunities for interactions among different agencies along any value chain, and the problem it faced in Nepal of lack of trust between farmers and traders could be easily addressed by such interactions.

IDE implemented the PMCA approach in locations that it had worked in under previous initiatives where a necessary actor architecture had already been established. It focused on activities that increased interactions and built trust, including those centred around joint planning and action. IDE conducted rapid market appraisals, trainings on grading, crop calendars and market oriented production planning; and organised exposure visits to explore larger markets. Finally, it brought together government departments and other agencies to showcase its activities. In essence, IDE used different components of PMCA to tackle specific situations and achieve targets.

ii) Putting DSP into use

Given that the DSP approach was developed in the same region the project was implemented in, this initiative did not need to with appropriate participation of farmers and other agencies. Hence significant adaptation was not required it to the given context. However for this knowledge to be applied in a larger area, an appropriate configuration of agencies was needed to be created. RDRS and its partner organizations organisations worked on this, with RDRS taking the lead in working with rice-field farmers, table-fish farmers, seasonal pond owners, and fingerling traders to bring them together and promote their participation. When the need arose to focus on developing a market for the fish produced, IDE-Bangladesh stepped in by strengthening linkages among different value chain actors. NGOs played a central role in coordinating with different agencies, ensuring information sharing, planning and execution of plans aimed at adoption of the approach in the area.

iii) Putting the multi-pronged approach into use

BAIF, which anchored the adoption of this approach, played a central role in bringing together relevant agencies — such as technical experts, market players and community members — to promote underused crops. It implemented this approach by folding it into a previous well-established project, the *Wadi* programme. Along the way BAIF made several adjustments to its original plans — as and when the need arose and based on feedback — including downsizing the village crop fairs into small local events where local stakeholders could participate. After much trial and error it now has a refined methodology, which it promotes in a larger area.

C. Private enterprises tend to lead the scaling up/out stage

In the final stages of the project, when the time came to scale the approach up and out, market-related actors and private enterprises stepped in, to varying degree, in all three projects.

i) Promoting PMCA with the help of local traders

In the PMCA case, IDE-Nepal decided to bring in traders with strong business interests to collaborate in the programme, given that they could benefit from access to larger quantities of good quality vegetables in graded form. Traders were able to further their business interests and are currently planning to explore larger national and international markets. In turn, they have contributed to the initiative by providing information on product requirements in higher-level markets and, thus, helping farmers plan for market-oriented production. Encouraged by higher returns, farmers have been increasing vegetable production and meeting stringent quality requirements. Local transport companies are also keen on participating in the initiative by helping traders transport produce to distant markets.

ii) The DSP approach turns fish-farmers into entrepreneurs

In case DSP case, rice field farmers have been adding to their incomes simply through minimal adjustments to their rice plots and with little additional investments. Those who own farm ponds are using them to raise table-fish, which they then sell for higher profits. Table-fish farmers who were promoted as satellite brood rearers are benefiting from selling GIFT brood fish to rice-field farmers. Fingerling traders have benefited from access to good quality fingerlings at local areas and at better prices. They have also been promoting rice-field fingerling production in order to access more fingerlings. Some large business enterprises have also been looking at this initiative favourably and plans are underway to adopt the decentralised seedling production approach.

iii) Marketing underused crops

In the case of the multi-pronged approach to promoted underused crops, an apex producers' company, VAPCOL, is spearheading moves to buy produce from farmers. Its elaborate market network ensures that the processed produce reaches the market and can, thus, offer better prices. At the local level, private agencies such those in the horticulture nursery business have seen their businesses grow through the supply of good quality planting material to farmers. The

village crop fairs have turned into mechanisms for different private entrepreneurs to participate and promote their businesses.

5. CONCLUSIONS

The three case studies analysed for the purpose of this paper reveal a process of constant research, networking, application and change. What is evident is that different roles and stakeholders come to the forefront at different points in time over the course of a project's terms. The initial stages of innovation process in agriculture value chains chain projects appear to rest on the creation of an appropriate configuration of agencies and the building of a necessary social architecture. This helps in the articulation of demand for specific new knowledge and also creates an enabling environment when the time comes to apply this new knowledge. Later stages involve various actors taking the lead to direct the project's focus, be it on research, field activities, market development, or any other. This has implications on planning projects that are aimed at putting knowledge into use.

This suggests that the main task of policy is not to fund the generation of new knowledge through research, or to "do development" — although these activities remain important. Rather, the main task of policy may be to have a capacity strengthening agenda. This capacity strengthening goes beyond developing the technical skills of actors and empowering poor people (again, these remain important). It concerns strengthening the collective dynamic of configurations of agencies working in and around a project.

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