

# The Role of International Agricultural Research Centres in Strengthening Rural Extension

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## Abstract

International agricultural research increasingly has to justify its relevance in reducing rural poverty in a sustainable way. Uptake and impacts have become more important than outputs (technologies and methodologies). With societal accountability on the rise, research centres are forced to reposition themselves in the innovation system. Although various CGIAR centres contributed to the development of new organizational models in research and extension, multiple challenges and opportunities to reach the rural poor remain unaddressed. In this paper I present three case studies. The first one introduces the challenges of changing scientists' mindsets towards local knowledge and innovations, using the example of predatory ants in biological control in tree crops. The second case presents the PETRRA project in Bangladesh whereby the International Rice Research Institute developed and managed a tender mechanism that facilitated the emergence of multiple service providers, each developing locally-embedded extension methodologies. The third case revisits Rhoades's groundbreaking insight that farmers need to be presented underlying scientific principles, rather than ready-made technologies and explores how CGIAR centres can play a role in developing regionally relevant learning tools that draw on this insight and that can be easily used by multiple service providers. Each case study is followed by policy implications.

## Introduction

In developing countries, a lot of knowledge - whether originated from science, commercial entrepreneurs or farmer experimenters - remains locked up and inaccessible to those who need it. The level at which national economies develop is determined by the efficiency of mechanisms set in place to exchange ideas between the multiple actors operating in the system (Arnold et al., 2001).

International agricultural research centres, including those of the Consultative Group on International Agricultural Research (CGIAR) that emerged about 40 years ago to address key production constraints, operate within quickly changing natural and societal environments. To what extent they are able to respond to these changing conditions and adapt their philosophies and *modus operandi* will determine their future relevance and *raison d'être*.

Recently the World Bank launched a new system to attribute funds to individual CGIAR Centres, placing more emphasis on outcomes than on outputs. This contributes to orienting the Centres towards working more in an innovation systems mode, whereby uptake and partnerships have to be thought through right from the beginning of the innovation process rather than at the end (the pipeline model of technology transfer). In what follows, I present three case studies that illustrate some of the new roles international agricultural research may assume.

## Case 1: Evolving supply and demand for sustainable fruit production

Farmers' knowledge and perceptions are very diverse and dynamic. As a consequence, gauging demand and developing technologies for and with farmers is no simple task. According to Bentley and colleagues (2007) "demand and supply of farm technology are like two sides of an unfolding conservation". Many technologies such as water management or integrated pest management (IPM) are knowledge-based and quick assessments (whether participatory or not) are unlikely to bring out the full range of testable solutions or development pathways. Farmers' demands co-evolve with learning and so should research questions.

But occasionally scientists neglect certain sustainable solutions by invoking excuses supposedly based on farmers' negative perceptions. I use the example of predatory ants in biological control in tree crops to illustrate my case. Weaver ants *Oecophylla* spp. are endemic in Africa and Asia and play a significant role as a natural crop protection agent in fruit, nut and timber crops, although many farmers and scientists are not aware of it (Van Mele, 2007). Weaknesses in both demand and supply of appropriate technologies seriously affect investments in agricultural research. Since 1997 I have worked with scientists, extension staff, farmers and business people in Vietnam, Indonesia, Benin, Guinea and Tanzania. Trying to introduce this simple, effective and pro-poor technology in agricultural research and extension systems in these diverse contexts allows for some extrapolations.

Overall, farmers in Asia have a positive appreciation of the ants for various reasons. Whereas Vietnamese farmers appreciate the ant for its contribution to pest management and improved fruit quality, rural folks in Indonesia mainly harvest ant brood to sell as food for song birds. African farmers, with the exception of smallholder farmers in Zanzibar who manage highly diverse perennial cropping systems, generally have an indifferent or negative appreciation of the ant. Only a few farmers in Benin actively introduced weaver ants in their mango plantations to protect their crop, but the bulk of them reported ants being a nuisance during harvest. A key question related to bringing in farmers' perspectives in agricultural research is to what extent one has to abide by farmers' negative perceptions? Why neglect a commonly available and highly effective solution in favour of externally-developed, expensive solutions? For years, scientists have tried to develop technologies to control fruit flies, yet with no proper solution for developing countries. Scientists seemed to exaggerate the ant's bite, which is not very painful, as an excuse to work on other topics. Sex pheromones and parasitoids are high technology, but they were not controlling the devastating fruit flies. Scientists' focus on developing high technology blinded them to working to reduce the nuisance of ant bites and to helping to change farmers' negative perception.

In the book *Ants as Friends*, Van Mele and Cuc (2003) combine scientific with local knowledge. We describe how to reduce ant bites when collecting nests or harvesting fruit by dusting the hands with wood ash. This is a local practice that was developed independently in Asia and Africa. Tests indicated that wood ash proved better than ash from herbs, and was acting as a hindrance to the ants rather than a deterrent. By interviewing farmers in Guinea, Benin and Tanzania, and building on my network with people across Africa, Asia and the Pacific, multiple ways to reduce nuisance have been collected and are currently validated.

Since 2005 Africa Rice Center (WARDA) has been temporarily relocated at the Biological Control Center in Benin, a sub-station of the International Institute of Tropical Agriculture (IITA). Although being appointed as a 'technology transfer agronomist' at WARDA, the situation allowed me to interact with all the biological control experts from the region and share my experiences with weaver ants in Asia, where I had been working for over 10 years. Only one French colleague (Vayssières) showed a keen interest. Two years later we published a paper in the *Journal of Economic Entomology* showing that weaver ants can effectively control fruit flies, including the invasive species *Bactrocera invadens* from Asia. I received telephone calls from journalists and emails from people across the globe. That this publication would spread like a wildfire went beyond my expectations, but apparently we had hit the bull's eye. In a mini-workshop in Tanzania, only one month after our paper had been published, high-rank staff from the Ministry exclaimed to be appalled that they had never been informed by national or international scientists about this home-grown solution. Resistance from the international research community to work on *Oecophylla* is waning, albeit slowly, probably as much triggered by our scientific results as by a sudden interest of donors to look

into this 'newly discovered' solution. Somehow I felt we had made our mark in history. This being said, donor staff turn over and continued arm-twisting by lobby groups remain realities. Small research grants of about 20,000 USD provided by the Conservation, Food and Health Foundation allowed us to achieve this. Small grants are more likely to lead to pro-poor innovations as creativity and flexibility flourishes better outside the political corridors of large donors and scientific lobby groups.

In 2007 I started backstopping various market-oriented agriculture support programmes in Burkina Faso and Ghana. The aim is to improve mango and citrus farmers' ability to compete in national, regional and international markets. Organic and Fair Trade markets in Europe triggered the demand for farmer training on sustainable solutions, including the use of weaver ants. Although trees are intrinsic parts of the diverse farming systems, national research and extension systems across Africa are hardly, if at all, equipped to promote good agricultural practices in fruit production. The discovery learning exercises, radio and other training tools that we currently develop with farmer associations, media experts, governmental institutions and the private sector aim at strengthening the multiple service providers across Africa. As this example shows, international agricultural research centres have a role to play in developing pro-poor international public goods in the form of research *and* extension outputs. These can be technologies, methodologies or tools. But once developed and tested with multiple stakeholders at pilot sites, others in the system need to take over.

### **Policy implications for agricultural R&D**

- IARCs ought to ensure local innovations are valued and incorporated in the agricultural innovation system. If they do not have the in-house capacity partnerships with appropriate actors should be a must to set research priorities;
- IARCs ought to stimulate local experimentation and facilitate south-south exchange of local innovations;
- Small funds allow for more flexibility in research than expensive projects. Mechanisms need to be developed to incorporate lessons learnt from such small projects into the bigger ones;
- Regular learning opportunities and monitoring need to be undertaken to change scientists' and extensionists' mindsets to listen to farmers and work with them. One-off workshops are unlikely to trigger this change;
- Emerging markets for organic and sustainably-managed fruit, nut and timber products can boost an interest in local innovations. Communication with consumers need to stimulate the multiple actors to appreciate such innovations;
- Farmers should be involved in the development of farmer- and consumer-education tools and communication strategies.

### **Case 2: Managing diversity in extension methodologies: the PETRRA case**

The Poverty Elimination through Rice Research Assistance (PETRRA) project, managed by the International Rice Research Institute (IRRI), established a values-based research management scheme in Bangladesh from 1999 to 2004. The 45 sub-projects had a respective focus on three broad areas: pro-poor policy (6), technologies (19), and uptake and extension (20) (Salahuddin et al., this volume). In what follows I highlight some of the findings related to extension and add new insights to improve the effectiveness of development interventions, as reported by Biggs & Smith (2003).

Learning helps to transform information into knowledge. Even if extension workers *sensu lato* improve the poor's access to information, questions arise as to what extent farmers can apply this information. What does it help to listen to a lecture or radio programme if the vocabulary is too pedantic or academic? And what is the best time and method to reach poor women, considering that the majority in rural areas is illiterate? Clearly, to assess the effectiveness of

learning, one has to consider the education approach, the content and the way this has been developed, and the context. Creativity is needed in developing farmer-education methodologies, but equally in engaging multiple service providers in pro-poor development (Bentley et al., 2005).

Many of PETRRA's extension methodologies were developed within the organisational culture of each partner, and were created or adapted locally through feedback from farmers. Encouraging local researchers and extension workers to think creatively and competitively about extension may have been as important in the long run as the new techniques they invented for growing rice. PETRRA encouraged a real diversity of extension methodologies (Table 1). Some were created fresh for this project, such as picture songs, or the prototypes came from elsewhere and PETRRA helped to shape them, such as Going Public. PETRRA also took some established methods and gave them a new angle, as making videos with adult education experts and rural women, for women (see Case 3).

**Table 1. Multiple extension methodologies** (modified from Van Mele et al., 2005)

Methodology	Circumstances under which methodology may be used
Women-led group extension	Requires communities where a certain critical mass of social capital is in place
Family approach in training	Is applicable for any community, irrespective of the level of social capital
Farmer-to-farmer extension	Requires solid organisational support for it to be effective and will work best if implemented alongside other rural development activities
Farmer field schools	Requires skilled facilitators and high investment cost. Best used in pilot phases to develop technologies and learning tools that can be taken up by other methodologies
Video-supported learning	Requires multidisciplinary approach in developing scripts. Adds value to any other methodology. Can be effective to educate farmers in remote areas without the need for well-trained facilitators
Going Public	Can be tried by any service provider with little preparation. Lends itself well to reach people in remote areas where general organisational support may be weak
Entertainment-education	Has a higher investment cost compared to video and if no use is made of radio or TV, the method is limited to areas where live performers operate. As it is more embedded in local culture, the scaling-up potential may be more limited than educational videos
Primary school and college education	Requires flexibility of education system and teachers' corps to include processes and tools of farmer field schools, or to organize video or agricultural entertainment shows. Children welcome this as a shift from sterile teaching methods in most rural areas

Several extension methods combine well. Going Public and farmer field schools (FFS) could interact with the media in interesting ways (see Bentley *et al.*, 2003). FFS could be turned into radio and video studios, where farmers could speak in their own words, to describe their experiences for the millions of farmers who will never be fortunate enough to attend a field school.

## Policy implications for agricultural R&D

- Facing high staff turn over, donors and R&D organizations require a system that supports institutional memory and learning;
- Donors ought to support a process approach that allows actors to be opportunistic;
- Donors promoting a single extension methodology slow down system learning in the long-run. Communication loops between multiple stakeholders and donors need to be revised so that donors remain well-informed of promising local, national and regional initiatives in extension;
- Competitive tender mechanisms ought to re-enforce the diversity of actors, technologies and methodologies in the system, and should build in a range of overarching values;
- The CGIAR has a role to play in testing, analyzing and documenting institutional innovations in research *and* extension (including uptake of technologies);

## Case 3: Rice video and radio programmes for farmers

### Rhoades Revisited

After rereading one of the first articles on farmer participatory research by Rhoades & Booth (1982) I was struck with how little research and extension had applied their groundbreaking insights that farmers need fresh ideas and be presented underlying scientific principles, rather than ready-made technologies. Discovery learning exercises like those used in participatory learning and action research (PLAR) or farmer field schools (FFS) form the exception, but my experience indicated that only a limited number of people have the capacity to develop such exercises. Besides, I had never encountered a service provider or farmer association who would use these exercises without having had prior extensive training. This story recounts my experiences in promoting both supervised and unsupervised learning among rural communities. I then draw some conclusions on how to enhance the efficiency of multiple service providers and what roles IARCs could assume.

Since 2001 I backstopped various organizations in Bangladesh, focusing on participatory development of on-farm rice seed management technologies. When in the early 1990s irrigated rice cultivation during the dry season became widespread, a particular new problem had arisen: 'how to properly dry seed during the rainy season?' We decided to focus on those topics identified by the communities as most relevant and for which a high potential for success and enthusiasm could be anticipated. Technologies should be accessible to resource-poor farmers, environmentally-friendly and gender-sensitive. The development of seed drying tables was obviously one of the options we could explore, although at this stage we were a bit reluctant to go in with a pre-designed model. We decided to introduce the principle of drying through a learner-centred approach rather than a fixed technology. In Maria village two insights shaped our future work: women seemed unaware that wind could dry seed and that seed could absorb moisture from the ground. Our discussion then shifted to stimulate the women's creative thinking on evaporation and ventilation. During my next visit, 3 months later, I was pleasantly surprised to see more than 50 different designs of seed drying tables. Further scaling-up took place through village picture exhibitions and public sessions at local markets (Van Mele et al., 2005a).

The project also conducted participatory research on seed storage. The conclusions were pretty much as we had expected: the more airtight the container was, the better the seed conserved. For research and extension the next step was obvious: plastic drums (one of the solutions tested) had to be promoted. I declined the idea and convinced colleagues that promoting plastic drums would kill the innovation process. Instead, we had to promote the idea of enhancing the air tightness and overall storage conditions.

We then took Rhoades' breakthrough one step further. While supporting farmer-to-farmer extension we soon realized some of its shortcomings: farmers would promote their own particular technology without elaborating on the principles underlying the technology. The *purdah* (a local custom, used for women's both physical veiling and symbolic separation from outsiders, men and elders) restricts women's movements outside their homestead. These conditions limiting scaling-up inspired us to develop four learner-centred videos dealing with on-farm seed management (Van Mele et al., 2005b). CAB International (CABI), the Rural Development Academy (RDA) at Bogra and Thengamara Mahila Sabuj Sangha (TMSS), a national women's NGO played a leading role.

Through multiple partners, the videos rapidly reached large parts of the rural communities. To test the videos' effectiveness, the project surveyed 1,252 resource-poor women across Bangladesh. New technologies such as manual seed sorting and seed flotation were adopted by 24% and 31%, respectively. More than 70% improved seed drying. The use of botanicals such as neem, to deter storage insects, increased from 9% to 67% (Van Mele et al., 2007). Most interestingly, the videos had triggered farmers to apply new ideas to their own context. Their experimentation led to a wide range of solutions. Seed quality and crop yields improved and women applied the principles to other crops. Some NGOs like TMSS even developed professional seed enterprises.

### **My move to Africa**

Initial hesitancy from management of the Africa Rice Center (WARDA) to me introducing the videos was based on two perceptions: African farmers would not like videos made in Asia and video was an inappropriate technology for the African context overall. I decided to test it on a small-scale with some of WARDA's partners. Feedback from rural women in The Gambia and Mali convinced researchers and NGO staff to translate the seed health videos into Mandinka and Bambara. We also organized a 2-week training course in Benin for staff from WARDA, and the NGOs SG2000 and Songhai, to learn how to make farmer-education videos. Countrywise Communication in the UK, whom had also trained the video team in Bangladesh, assisted the new team to produce a first African video on rice parboiling.

I continued networking with numerous organizations in WARDA's member countries. In this continent-wide experiment of unsupervised learning I supported the translations of the videos in local languages, yet only where local capacities were weak and where a clear interest of multiple service providers existed. In 2007, the seed and post-harvest videos were available in 15 and 7 African languages, respectively.

### **Linking to politics, private sector, national media and extension education**

The South Asian Association for Regional Cooperation (SAARC) has a specialized department for agricultural information dissemination called SAIC. In 2006 the Prime Minister of Bangladesh convinced SAIC of the impact of the rice seed videos in his country and to disseminate them to farmers of SAARC member countries. Continued support and advocacy since 2002 from the directors-general of the Rural Development Academy in Bogra, the leading organization in the project in Bangladesh, had resulted in political buy-in at the regional level.

By 2007, WARDA had mobilised more than 60 partners throughout Africa. The private company Tilda and the NGO SG2000 supported the translations in East Africa. In Benin, Tundé Group, who own a printing and car dealing business, recently became interested in rice processing. To ensure he will receive quality input for his rice mill (which will become operational in 2008), Tundé decided to translate the rice videos in local languages and have them broadcast on the national TV. The Gambian Radio and Television Services broadcast the videos in September 2007, but this was only a one-off. Mobilizing national media is expensive in most African countries, and having the private sector chip in offers some opportunities to stimulate farmer learning.

Many organizations use generator-powered equipment with large screens, or locally-available white cloth, and organize shows the evenings before market days to reach large audiences.

This is another example of reducing transaction costs by *Going Public*, or doing extension where people meet naturally without having to call for group meetings and disturb farmers' daily routine (Bentley et al., 2003).

In Guinea, the NGO APEK trained 6,500 farmers and staff of grassroots organizations with video. Later on, rural radio interviewed farmers about what they had learnt from the videos. The resulting 25-minute radio programme was broadcast twice a week for three months, potentially reaching over 800,000 people.

In Uganda, the project APEP used the mobile cinema approach in multiple refugee camps. They reached over 7,000 farmers who had received seed of the New Rice for Africa (NERICA) for upland rice cultivation.

In Bangladesh, the Agricultural Advisory Society (AAS), a small national NGO having strategic alliances with a large number of local NGOs and community-based organizations distributed videos to village tea stall owners who organized 8,600 shows on their premises at no cost, motivated by increased business. About 157,000 farmers watched the videos 1-6 times. The Bangladeshi national TV continues to freely broadcast the videos, reaching over 40 million rural people.

All the examples above have one thing in common: local people appreciated the content of the videos and their relevance to the farming communities they were working with. All were challenged to think outside the box and took the initiative to make it work in their own context.

As the videos also changed the attitude of researchers and development workers towards local innovations, WARDA actively encouraged the incorporation of the videos into the curricula of African and Western universities. Agricultural colleges in Guinea, Makerere University (Uganda), Sokoine University of Agriculture (Tanzania), the University of Abomey-Calavi (Benin), universities in Canada (Guelph) and Europe (Reading, Ghent and Leuven) use the Rice Media Project as a case study in their courses, as such influencing the development of future professionals.

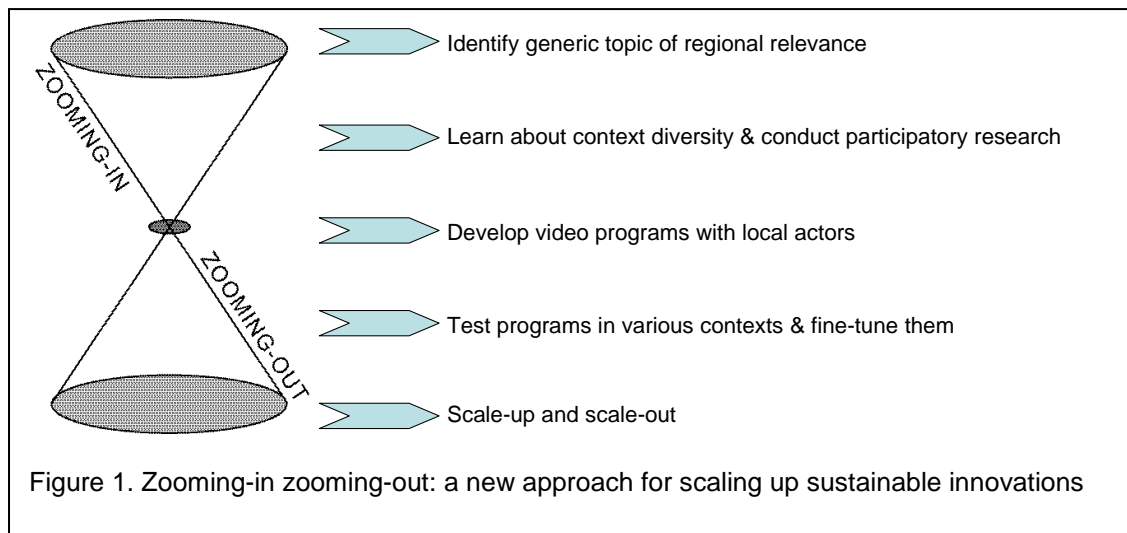
The social capital and trust of various IARCs puts them in a particularly favourable position to strengthen the multiple extension, education and service providers in national innovation systems. But for this to take place IARCs, and the donors supporting them, must recognize the wider role they ought to play.

### **Zooming-in, zooming-out**

Centres of the CGIAR are obliged to develop international public goods. Apart from producing regionally relevant rice videos, five years of process evaluation had allowed us to develop a new approach to enhance the efficiency of learning within national innovation systems. As extension systems become decentralized, many service providers develop their own materials and methods. As most lack adult education and communication expertise, these are not always effective. Hence, based on experiences in different contexts WARDA developed, tested and documented an approach for effectively communicating agricultural technologies with the rural poor. The *zooming-in zooming-out* (ZIZO) approach provides guiding principles to produce high quality farmer-education tools that are locally appropriate and regionally relevant (Van Mele, 2006).

*Zooming-in, zooming-out* starts with a broad stakeholder consultation to define regional learning needs (Figure 1). Only then are communities approached to get a better feel about their ideas, knowledge, innovations and the words they use in relation to the chosen topic (zooming-in). Educational videos are produced in close consultation with the end-users and building on Rhoades' principle of communicating ideas rather than ready-made technologies. Consequently, when showing the draft videos to further villages (zooming-out), more novelty is identified, and further adjustments made.

If the topic is truly of regional relevance, multiple service providers will be ready to incorporate the videos in their own programmes. Some facilitation to make this happen may be required, such as networking and translating into local languages.



Evidence shows that based on a few well-selected local innovations, and merged with appropriate scientific knowledge, video was able to explain underlying biological and physical principles. The more these principles resonated with what farmers already knew and did, the more video became useful as a stand-alone method. Facilitation increased the level of experimentation with sustainable technologies, but was not always a prerequisite (Van Mele et al., 2007). Ideally, graduates of farmer field schools or farmers engaged in participatory research should take part in developing videos.

Apart from strengthening extension and other service providers, the videos impacted on rural communities in four Asian (Bangladesh, Nepal, India and Cambodia) and six African countries (Benin, Gambia, Ghana, Guinea, Mali and Uganda) – true south-south communication. In 2006, video-supported group discussions reached 400,000 farmers.

The relevance of the technologies alongside a creative communication approach has resulted in the videos being scaled-up to millions of farmers in Asia and Africa through both facilitated group discussions and non-supervised learning, such as video shows in tea stalls and mass media. Farmers can learn by watching other farmers on video, if the programmes are well planned and simply structured. The *zooming-in zooming-out* approach enhances the efficiency and effectiveness of pro-poor rural learning systems.

### Policy implications for agricultural R&D

- Experiential learning can be stimulated in many ways, and considering the limited financial resources attributed to national extension systems, more attention needs to be paid to improve ways of unsupervised learning;
- IARCs role can and should extend to build national capacities in developing high quality, learner-centred education tools and strategies. This will require them to open up to a different type of professionals;
- IARCs have a role to play in facilitating processes, mechanisms and institutions supporting farmer-centred approaches in both technology development and dissemination;

- IARCs can help in scientifically assessing the efficiency and effectiveness of uptake methods, rather than just focusing on measuring the impact of their home-grown technologies;
- IARCs, such as WARDA in Africa (case 3) and IRRI in Bangladesh (case 2), that have strong links with the national R&D systems ought to play a role in facilitating and documenting processes of innovation;
- Stimulating IARCs to expand their roles in national innovation systems requires donors to create more flexible learning environments and move away from logical frameworks with pre-set quantifiable targets.

## Conclusion

Farmers do not always ask for sustainable solutions, neither are they aware of the full range of solutions. International agricultural research centres have a role to play in generating pro-poor technologies, but their role in strengthening extension and service providers has hardly been articulated. While the recent focus in agricultural innovation system thinking contributes to making CGIAR research more relevant and forging partnerships with non-traditional partners, the development and testing of pro-poor uptake pathways, processes and mechanisms remain by and large unaddressed by current research management schemes. Donors want to see impact of research, yet Barnett (2004) argues that the mechanisms they use to increase this impact may be misplaced. Development returns to donor investment in research will only be boosted if linkages between multiple actors in the innovation system are strengthened, not if the focus remains on strengthening scientific capacities in isolation. In developing countries, "R&D is mostly about learning, rather than about creating new knowledge" (Arnold et al., 2001).

To move beyond the 'islands of success' of participatory research and interventionist reflections on innovation systems, more resources will need to be allocated to a different type of research, including research on pro-poor and gender-sensitive 'extension' tools, mechanisms and alliances. Without this, innovation systems' thinking is unlikely to make a difference for poor farmers in developing countries. Donors have a part to play in supporting organizations equipped to strengthen the quality and effectiveness of the multiple extension and service providers.

The three case studies presented in this paper each highlight how international agricultural research institutes can fulfil diverging and evolving roles within the innovation system. This may range from developing new and documenting existing appropriate technologies to building capacities among service providers and facilitating linkages and learning between multiple actors. To what extent CGIAR centres can and want to accommodate these changing responsibilities is determined by the orientation of its senior staff and management, as well as by the donor community.

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