CHAPTER

14

Strengthening Capacity to Achieve Eco-Efficiency through Agricultural Research for Development

Simone Staiger-Rivas,[1*] *Sophie Álvarez,*[2] *Jacqueline Ashby,*[3] *Mark Lundy,*[4] *Rachel Muthoni,*[5] *Paola Andrea Victoria,*[6] *Carlos Arturo Quirós,*[7] *Cristina Sette,*[8] *Maya Rajasekharan,*[9] *Nathan Russell*[10]

Contents

Abstract

Global climate change and food security are complex and closely intertwined challenges. A key requirement for dealing with them successfully is that agriculture becomes more eco-efficient. As researchers work toward this goal, they must always ask, "Efficiency for whom?" Finding answers to this question requires that research be conducted from a systems perspective in a broadly participatory manner involving complex collaborative arrangements.

In recent decades, training and other efforts to strengthen the capacity of national partners in such collaboration have declined because of funding scarcity. As a result, key links in the chain that

[1] Leader, Capacity Strengthening and Knowledge Management Initiative, International Center for Tropical Agriculture (CIAT), Cali, Colombia.

[2] Consultant Monitoring and Evaluation, CIAT, Cali, Colombia

[3] Development Sociologist, Senior Advisor on Gender Research, CIAT, Cali, Colombia.

[4] Senior Researcher, CIAT, Cali, Colombia.

[5] Social Scientist and Monitoring and Evaluation Support, CIAT, Kampala, Uganda.

[6] Masters Degree student, formerly Research Associate, CIAT, Cali, Colombia.

[7] Consultant, formerly CIAT, Cali, Colombia.

[8] Program Specialist, Institutional Learning and Change (ILAC) Initiative, Rome, Italy.

[9] Program Coordinator, CIAT, Cali, Colombia.

[10] Head of Corporate Communications, CIAT, Cali, Colombia.

*Corresponding author: s.staiger@cgiar.org

connects research with development have been weakened, thus diminishing the ability of research to reach end users effectively. Many approaches, backed by practical experience, have been developed in an effort to reduce the gaps between research and development. Among these approaches are new partnership styles, participatory research methods, novel strategies for strengthening agricultural value chains, qualitative monitoring and evaluation, and knowledge management and sharing. All of them contribute broadly to capacity strengthening by empowering stakeholders and by fostering joint learning rather than reinforcing unidirectional technology transfer. These approaches can contribute importantly to mainstreaming eco-efficiency in agricultural research for development, particularly if currently separate and isolated interventions are combined under a comprehensive strategy.

Introduction

This chapter describes five key interventions that are important for mainstreaming eco-efficiency in research for development:

1. Partnership strategies
2. Participatory research
3. Learning alliances
4. Monitoring and evaluation
5. Knowledge management and sharing

Each aims to foster innovation and social learning, which are essential for adapting agricultural systems to changes in the climate and in local and global economies. These practices can be particularly effective if used in an integrated manner.

Evolving approaches

Capacity strengthening has evolved considerably over the years, as agricultural research has come to focus more sharply on development. Table 1 summarizes this shift from a relatively narrow focus on training for improved food production, mainly through plant breeding, to a more systemic approach for rural innovation.

As research for development has evolved, it has searched for better ways to reach large numbers of end users. Reflecting on obstacles to research impact in the 1990s, social scientists began to question the so-called "pipeline" approach for addressing farmers' problems through scientifically proven technologies. Starting about 30 years ago, various participatory approaches were developed and tested, with emphasis on the learning cycle, in which users of agricultural research products and services learn together through partnerships and stakeholder engagement, thus increasing the chances of research results being put to use.

Table 1. Evolving approaches to capacity strengthening.

Decade	Research focus	Key partners	Principle mode of knowledge exchange	Entry points for capacity strengthening
1960s and 1970s	Improving food production through plant breeding	National agricultural research institutes	Technology transfer through extension	Training
1980s and 1990s	Natural resource management and sustainability	Advanced research Institutes	Networks	Participatory research
2000s	Development challenges and innovation systems	Multi-stakeholder partnerships	Multi-stakeholder platforms	Learning alliances

SOURCE: Based on Eckboir and Sette (2010).

Social learning and innovation

Current approaches have their roots in two closely related theoretical fields: social learning and innovation systems. According to Leeuwis and Pyburn (2002), academics introduced the concept of social learning with an interest in studying and promoting sustainable development (Dunn, 1971; Friedmann, 1984; Milbrath, 1989; Woodhill, 2002). Social learning, as described by Röling (1992), assigns a central role to multi-stakeholder platforms that facilitate interaction and promote learning for change. The facilitator's role is to help establish these platforms and catalyze dynamics that foster synergy.

The concept of innovation systems emerged from inquiries into research and technology transfer, leading to an examination of the wider innovation process (Hall et al., 2004). Innovation is a complex process, described by Smits (2002) as the successful combination of "hardware" (new technical devices), "software" (new knowledge and modes of thinking), and "orgware" (new institutions and forms of organization). It depends on effective collaboration, networking of interdependent social actors, and other new forms of coordinated action. Innovation is thus a collective achievement rather than the result of individual adoption (Leeuwis, 2004).

A key message of this chapter is that making agriculture more eco-efficient requires a major commitment to developing capacity for innovation through continuous learning, particularly for stakeholders who have previously been excluded in research. One recent study (Mehta-Bhatt and Beniest, 2011) suggests that CGIAR centers have responded in various ways to new trends in capacity development. The sections that follow explore some of the results.

Partnerships: From Knowledge to Action

The authors of a recent working paper (Horton et al., 2009) define partnership as "a sustained multi-organizational relationship with mutually agreed objectives and an exchange or sharing of resources or knowledge for the purpose of generating research outputs (new knowledge or technology) or fostering innovation (use of new ideas or technology) for practical ends." As this definition suggests, partnerships may involve diverse actors, working under informal or formal arrangements while sharing responsibilities and decision-making. They may also have a wide range of objectives—from the delivery of specific research products to the creation of a shared context for innovation and joint learning.

Box 1

Fruit and vegetable research: moving in the right direction

As described in Chapter 12, researchers are using participatory methods to develop technologies aimed at ecologically sustainable improvement in the production of fruits and vegetables. This work provides a clear example of how research can help build the capacity of smallholder farmers to deal more effectively with shifting production constraints and market conditions through more eco-efficient practices.

Such initiatives require that scientists take a more systemic view, emphasizing the importance of crop diversity and of maximizing the producivitty of varied ecological niches. It is also important for donors and other stakeholders to create a policy environment that encourages collaboration between research and development agencies. Financial and human resources must be dedicated to the promotion of greater crop diversity and to the development of more resilient and profitable agricultural systems. A different type of education is needed to avoid overspecialization in agriculture and to promote better understanding of integrated crop management options, of the need to balance crops and livestock, and of the importance of balanced human diets.

Partnerships are essential for achieving impact through today's complex and ambitious agenda of agricultural research for development. Key actors in this work include civil society organizations, national research and educational institutions, the private sector, national policy makers, regional multi-stakeholder networks, donors, and the media. Such partners bring diverse perspectives to bear on shared goals, providing the basis for an equitable learning culture. This can increase the potential for solving problems successfully, generating useful knowledge, and empowering local actors. Further benefits include stronger resource mobilization, greater legitimacy, reduced risks, and increased flexibility.

More systemic approaches to partnership

Partnerships have evolved in step with the broader trends in agricultural research that are described in the introduction to this chapter (see Table 1). The purely research alliances of the 1960s have given way to new contractual relationships, which in the best cases transform knowledge into action, leading to sustainable development outcomes.

This shift involves more systemic approaches to partnership, in which research is just one part of a complex puzzle (Kristjansen et al., 2009) or "complex adaptive system," which also involves development methods and evolving knowledge, attitudes, and skills. Current partnerships often use tools such as outcome mapping, participatory impact pathway analysis (Alvarez et al., 2010), and other types of stakeholder analysis, such as social network analysis, for joint planning. Such approaches are useful for determining each partner's degree of influence on users of research products and therefore their potential multiplier effect and contribution to impact.

Partnerships figure importantly in the new research strategy resulting from recent CGIAR reforms (CGIAR, 2011). They are central to more innovative arrangements in research for sustainable development that involve advanced research institutes, reduce costs, and deploy new technologies, among other ends (Spielmann et al., 2007).

Partnerships for eco-efficient agriculture

Since eco-efficient agriculture aims to reduce negative environmental impacts, its success depends on partnerships involving stakeholders engaged in environmental research and advocacy. Civil society organizations have an especially important role to play in these partnerships because of their ability to achieve positive multiplier effects (CGIAR, 2006), including the development of site-specific solutions that address the needs of the rural poor.

Partnerships for eco-efficient agriculture must pay particular attention to the needs of women. According to FAO (2011), women comprise, on average, 43% of the agricultural labor force in developing countries, ranging from about 20% in Latin America to almost 50% in eastern and southeastern Asia and sub-Saharan Africa.

Interestingly, the report observes that female farmers produce less than male farmers, not because they are less efficient but because of differences in their use of inputs. This underscores the need for further research on the relationship between gender, production, and eco-efficiency. It is also important for research partners to be selected on the basis of their gender vision and practices, with the aim of achieving gender balance in partnership governance.

Partnerships as learning opportunities

Institutional arrangements in research for sustainable agricultural development are increasingly based on equity and accountability among all stakeholders (GFAR, 2010). Establishing trust and respect are fundamental for building confidence and empowering stakeholders.

Box 2

Nontraditional partnerships for impact

Multi-stakeholder roundtables, such as the Better Sugar Initiative, the Roundtable for Sustainable Palm Oil, and the Roundtable for Responsible Soya, among others, demonstrate increasing concern about more-sustainable agricultural development. With growing frequency, even the big players in food production are asking whether it makes sense to develop a market unless it can be done in a sustainable way.

The US-based Sustainable Food Lab and the European Sustainable Agriculture Initiative Platform promote collective action across sector boundaries in such initiatives as certification schemes and smallholder inclusion. Unilever has set the goal of making every supply chain it works with (cocoa, sugar, tea, soybean, and so forth) sustainable by 2020. For this purpose, the company has developed its own sustainable agriculture code, which identifies social inclusion as the best way to practice corporate responsibility.

Roundtables, codes, and guidelines provide important opportunities for the private sector to engage with agricultural science aimed at achieving eco-efficiency. While big NGOs and private-sector actors set the rules, agricultural science can contribute high-quality research and strong public-sector connections.

As development expert Robert Chambers noted in a recent interview:

> "So much in a partnership depends on what sorts of people are involved, how they relate to one another, how participatory they are, whether they dominate or whether they facilitate, how they make other people feel, whether they feel comfortable, whether they feel they can be open, or whether they feel they are vulnerable to criticism. Linked with this are power relations, which are inevitable, particularly when funding is involved. (ILAC, 2010)"

Partnerships offer three main opportunities to strengthen capacity for innovation and social learning:

1. **Complementary competencies:** Achieving sustainable development requires that diverse partners pool their assets—such as specialized knowledge and human capital—under new institutional arrangements. The idea is to form multidisciplinary teams that are able to learn together across organizational and geographical boundaries (Lundy et al., 2005).
2. **Increasing scale and reach:** Partners are potential multipliers of new information and knowledge. They can help fuse new knowledge with current knowledge and increase its flow into research and development networks and communities, often in multiple languages. Effective partnerships are useful for positioning such knowledge in the wider market, for example, among policy-makers (CGIAR, 2008). Resulting growth in the scale and reach of knowledge compensates for the initial costs of creating and facilitating partnerships.
3. **Contribution to organizational development:** Working in broad, multidisciplinary and geographically dispersed partnerships is challenging, but this can contribute to greater institutional openness in terms of cultural and gender issues. Partnerships are especially useful for this purpose if participants share lessons and insights, thus contributing to the learning cycle in which mistakes and disappointments serve as a springboard for reflection and revision (Tennyson, 2003). What often happens instead is that partnerships remain at the periphery of institutional learning, and neither leadership nor individual partners share best practices (Smith and Chataway, 2009). Partnerships are often driven by personal relationships; researchers and stakeholders decide to work together because they know and trust one another and share a common vision and field of interest. More attention should be paid to ensuring that partnership behaviors, policies, strategies, and practices progress from the micro level of individuals to the meso level of the organization (Özgediz and Nambi, 1999).

Given the urgency of the multiple challenges that agriculture faces today, partnerships focusing on eco-efficiency must quickly provide strategies that translate knowledge into action and offer solutions that are effective and easy to implement. The increasing complexity of partnerships poses a major challenge. The following sections provide insights on how partnerships for eco-efficiency can be made to work.

Participatory Research

Participatory research methods arose in agriculture during the 1980s. They responded to the need for research to generate technologies that are more appropriate for small-scale farmers, resulting in wider adoption and greater benefits. The strategy for this work was to provide small-scale farmers with assistance in managing risky innovations collectively, obtain feedback for researchers from farmers, and delegate the implementation of adaptive technology testing to farmer associations or groups (Ashby, 1985). As participants in research, farmers can better communicate their perspectives on what, where, and when to research and their criteria for success. Farmers thus engage in the co-development of knowledge, taking responsibility for decisions about priority setting, implementation, and recommendations (Cárdenas and Gloria, 2009).

Farmers as researchers

Participation in research is not to be confused with the discovery learning process used to teach farmers about recommended technologies. The latter is an extension method, in which farmers conduct their own experiments to demonstrate known principles and practices. In contrast, participatory research involves collaborative investigation of options for innovation, about which researchers are just as uncertain of the outcomes as are producers.

Participatory research in agriculture evolved from participatory rapid appraisal in rural development projects to the application of similar techniques for the purposes of research. New methodologies soon followed, which national and international research centers used for participatory selection of experimental germplasm of grain legumes (Mazon et al., 2007), applied research in farmers' fields (CORPOICA, 2002), and research to develop and strengthen community organizations and their links with markets (CRS, 2007).

Participatory research and social analysis

To be effective, participatory research methods should be used in conjunction with social analysis. This is essential for determining who should participate, when, how, and where and also for ensuring that results are representative and can be generalized. In rice production, for

Box 3

The value of participatory technology evaluation

Experience in Malawi with the evaluation of legumes for soil fertility improvement demonstrates the value of participatory technology evaluation. At first, farmers were averse to adopting legumes for this purpose, despite having serious soil-fertility problems. But they adopted the practice enthusiastically after participatory technology evaluation helped researchers understand farmers' priorities. Testing with more than 3000 men and women farmers showed that they preferred edible species, such as pigeon pea and groundnut, over mucuna, a green manure crop that researchers had recommended.

By 2001, 72% of the target farm population had adopted pigeon pea and groundnut, compared with only 15% the year before. Evaluations found that children were better nourished in households that had adopted the edible legumes.

SOURCE: Kerr et al. (2007).

example, achieving eco-efficiency implies very different outcomes for women who transplant rice, men who own rice paddy land, and ethnic minorities who want to preserve forests from encroachment by rice cultivation. The gender, ethnic identity, and social class of research participants must be investigated through social analysis to ensure that different groups in the intended beneficiary population are represented appropriately.

Participatory research approaches

Participatory methods have been applied in agriculture specifically for experimentation with farmers, participatory plant breeding, participatory technology development, participatory market appraisal, and communication for development.

Participatory methods have been widely used for farmer experimentation in Latin America (Braun and Hocdé, 2003). One such experience involved a method centering on farmer research committees (or CIAL, its Spanish acronym). These are groups of volunteer farmers from a community or farmer association who apply a simple form of the scientific method to study different options for improving local agriculture (Ashby et al., 2001). Participatory plant breeding is used worldwide for the evaluation of crop varieties and selection of parental materials and their crosses (Goncalves and Saad, 2001; Almekinders et al., 2006). New information and communications technologies have created opportunities for applying participatory principles and methods in combination with technology-mediated learning approaches involving video, radio, and web 2.0 technologies (Van Mele et al., 2010), as well as knowledge sharing tools and methods (Staiger-Rivas et al., 2009).

Institutionalizing participatory research

Participatory research capacity forms a crucial part of the overall capacity for innovation that is needed to achieve eco-efficient agriculture. It is particularly essential where public and private organizations are ill-equipped to address the multiplicity of small adaptive changes and trade-offs between desired environmental and production outcomes that farmers must constantly deal with as they fit new technologies to changing circumstances.

Strengthening capacity for participatory research must involve a wide array of professionals providing agricultural research and advisory services as well as others who contribute to innovation, including farmers, traders, and consumers. To institutionalize participatory research requires changes in policies and procedures aimed at making agricultural research and advisory services more accountable to farmers and other stakeholders. Thus, capacity strengthening must go beyond the use of participatory methods to include significant institutional changes, which are critical for achieving an eco-efficiency revolution.

Evidence of impact and future opportunities

The impact of participatory research has been widely evaluated. Impacts include increased yields in small-scale crop production (Catavassi et al., 2009) and higher yields and adoption rates as a result of participatory plant breeding (Ceccarelli et al., 2000).

Experience in Honduras shows how a participatory approach enabled farmers to obtain maize varieties that are well-adapted to local growing conditions. As shown in Figure 1, 59% of the farmers who were CIAL members engaged in participatory selection of maize varieties reported yield increases, compared with only 28% of those who were not CIAL members (Classen et al., 2008).

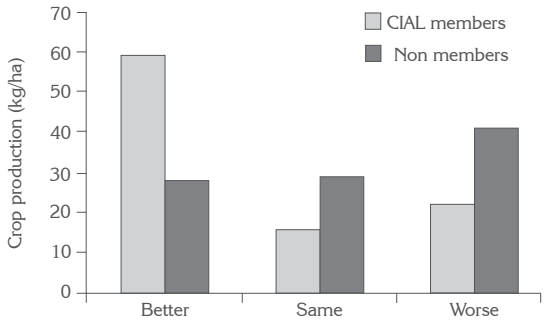

Figure 1. Changes in maize yields in Honduras, 2007.

In Latin America, plant breeders have used participatory technology evaluation widely to obtain information about farmers' preferences. Recently published work includes case studies organized according to the stage of the plant breeding cycle in which farmers participated. Overall, the results consistently show that when varieties are evaluated with farmers the rates of acceptability and adoption are higher. Involving farmers at an early or mid-stage in the breeding cycle—that is, well in advance of prerelease testing—allows breeders to take into account farmers' preferences when setting priorities, thus enabling them to provide farmers with benefits in less time than with conventional breeding (Ashby et al., 2009).

Described below are two new opportunities for using participatory research methods:

- **Training in innovation:** Institutionalizing participatory research as a means to promote pro-poor innovation is important for achieving eco-efficient agriculture. Capacity strengthening in available tools through partnerships with universities and development agencies is an effective way to heighten awareness of this approach and strengthen capacity to use the tools available. Demand for this service is growing among national and international non–governmental organizations (NGOs), such as World Vision, and agencies such as Oxfam International and the World Food Programme. They are particularly interested in monitoring and evaluating the use of participatory methods to promote technological innovation as they shift emphasis from humanitarian relief to food production.
- **Climate change:** To assist farmers in coping with the impacts of climate change, research must incorporate local knowledge. Participatory plant breeding, for example, can be used to develop crop varieties that are not only better adapted to harsher conditions but closely match farmers' other needs, providing broad genetic diversity and more flexible seed systems.

Making agriculture more eco-efficient involves choices based on value judgments about alternatives. Some options may have positive or negative implications or involve trade-offs between competing objectives and interests. For that reason, researchers must always ask, "Efficient for whom?"

Participatory research is one of several approaches that can help address this question. It is particularly useful for taking into account different perspectives and priorities when deciding what the research problems are and what constitutes an eco-efficient innovation. Understanding farmers' demands and limitations is essential for finding solutions that are feasible for participating farmers.

Learning Alliances to Connect Research with Development

The gold standard of research consists of publishing one or more articles in peer-reviewed journals aimed at a scientific audience, which may number in the thousands. Traditional development practice, on the other hand, focuses on solving problems for as many people as possible as quickly as possible. Its gold standard constitutes a favorable impact assessment, showing that a project has delivered considerable livelihood gains for the poor both in quantitative and qualitative terms.

Somewhere along the continuum between these caricatures of research and development lies the current reality. The CGIAR has recently announced that it will focus more strongly on achieving research outcomes that are reflected in measurable improvement of rural livelihoods. Yet, the incentive structures still favor scientific outputs over development impact.

Meanwhile, development practitioners have adopted various approaches to monitoring, evaluation, and learning in an effort to enhance performance. Learning alliances provide an institutional framework for facilitating more effective and consistent connections between research and development, as both strive to improve the lives of the rural poor.

The learning-alliance approach

Learning alliances differ substantially from common training practices, especially those involving short, one-off courses. This approach involves rather an iterative learning process undertaken jointly by multiple stakeholders, with the aim of improving the learning and innovation capacity of agencies that support farmer associations. There are three types of learning alliances (Table 2; Best et al., 2009).

Partners in such collaboration need to agree on basic principles of collective work, including:

- **Clear objectives:** These must reflect the needs, capacities, and interests of the participating organizations and individuals. What does each organization bring to the alliance? What complementarities or gaps exist? What does each organization hope to achieve through the collaboration?
- **Shared responsibilities, costs, and credit:** A learning alliance seeks to benefit all parties, so costs, responsibilities, and proper credit for achievements should be shared among partners.
- **Outputs as inputs:** Rural communities are diverse, and there are no universal recipes for sustainable development. In learning alliances, the outputs of research and development are viewed as inputs for rural innovation at specific places and times. The particular methods and tools employed may change, as users adapt these to their needs and circumstances. Key challenges are to understand the reasons for adaptation and its positive or negative impacts on livelihoods as well as to document and share lessons learned.
- **Differentiated learning mechanisms:** Learning alliances involve diverse participants. Determining each group's willingness to participate in the learning process is critical to success. This requires flexible but connected learning methods, which range from participatory monitoring and evaluation through conventional impact assessment to the development of innovation histories.
- **Long-term relationships based on trust:** Rural development takes place over many years. To influence positive change and understand why change has occurred requires long-term, stable relationships capable of evolving to meet new challenges. Trust is the glue that binds these relationships.

Capacity strengthening for innovation and scaling up

Under learning alliances, the learning process typically spans 12 to 24 months (Best et al., 2009). It involves learning cycles, which include feedback loops and opportunities for reflection and documentation aimed at improving practice. This approach consists of four interrelated learning strategies:

1. **Capacity building:** This activity is not limited to training but focuses on practical application of methods in the field, follow-up, adaptation, and improvement. Partners receive ongoing support as they implement prototypes. This process is linked to specific learning cycles, which strengthen partners' ability to use specific tools

Table 2. Types of learning alliance.

Type	Need	Focus
1	Building capacity and skill	Training and learning using concrete, practical approaches and proven methods
2	Developing new methods, tools, and approaches	Action research that generates methodology guides based on good practice, which is then validated through capacity-development learning cycles
3	Generating information that can influence policy	Conventional socio–economic research to understand principles and lessons across experiences

SOURCE: Best et al. (2009).

and approaches, adapt them to their needs, and discern when particular methods might or might not be useful.

2. **Targeted action research:** Such research addresses specific knowledge gaps identified with partner agencies. Key research questions are identified and fieldwork designed and implemented collaboratively by research and development agencies. Outcomes and findings are shared with other partner agencies, selected decision-makers, and the general public through workshops and in electronic formats.
3. **Connectivity and knowledge management:** These aim to strengthen the relationships that form the basis of the learning alliance through densification of networks and personal connections. To achieve this, the alliance can use face-to-face meetings, training-and-exchange visits, and virtual tools such as a web site and list server.
4. **Evidence-based decision-making:** Aimed at influencing organizations in the public and private sectors, this strategy has been markedly less successful than the other three. Nonetheless, learning-alliance partners consider it to be critical for leveraging high-level change based on field results.

Alliance partners learn primarily through a learning cycle for each topic of interest, as shown in Figure 2.

The learning alliance model involves the following activities, themes, and challenges:

- **Identifying learning topics:** Identifying and clearly articulating the content of a given learning cycle requires extensive discussion, which is often time-consuming and may become acrimonious. Nonetheless, once the partners reach consensus, the result is a more effective learning cycle.
- ***Identifying good practices:*** This step generally involves a thorough literature review. It is essential to avoid "reinventing the wheel,"

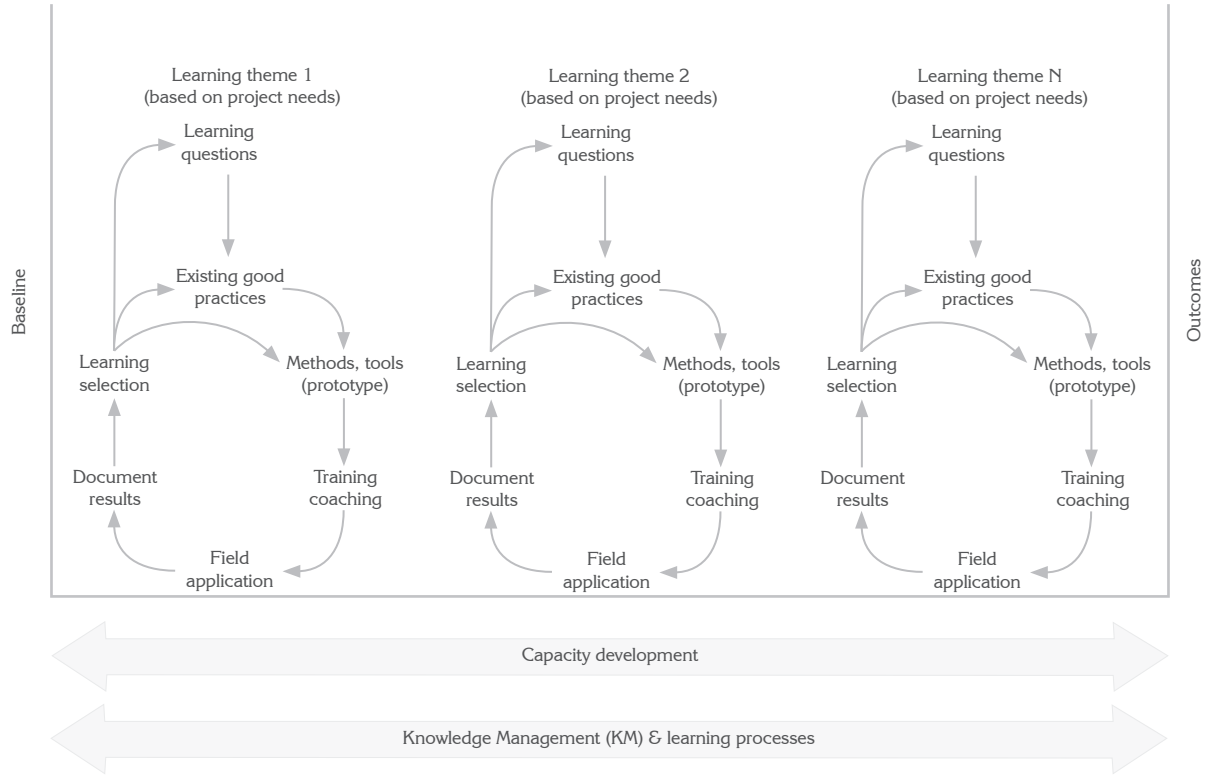

Figure 2. Learning alliance model.

so an adequate budget is required. The review can be brief if acceptable methods and tools are already available.

- **Prototype development:** At this stage, the challenge is to strike a balance between tools of interest to development actors and testable hypotheses of interest to researchers. Without this balance, partners end up spending more time than anticipated to develop a prototype. A related challenge is that researchers, accustomed to working with academic publications, may not be capable of producing effective field materials.
- **Field testing:** A major challenge of this work is to develop an evaluation framework—one that is robust yet simple and cheap—for measuring field performance of the prototype. This requires a mix of development actors and researchers, with a budget for monitoring and evaluation.
- **Documenting results:** Documenting the learning process can be difficult with development actors who are not accustomed to writing technical reports. One way to address this problem is through "write-shops," whereby project participants document their results through structured reflection with the end-goal being to produce written documentation. The task requires a significant effort on the part of researchers to ensure that the results are adequately linked to the monitoring and evaluation framework.

Box 4

Learning-alliance outcomes and impacts

A learning alliance in Central America for rural-enterprise development contributed to significant changes in the knowledge, attitudes, and practices of 25 partner agencies, which influenced a network of 116 additional organizations. By 2007, the alliance had contributed to benefits for 33,000 rural families (about 175,000 people) in El Salvador, Guatemala, Honduras, and Nicaragua.

The alliance resulted in stronger networks with end users, involving both development actors and researchers. Partners changed from competitive to collaborative attitudes as they saw evidence that working together enhanced their capacity to meet the needs of rural communities and to obtain donor funds. These shifts, in turn, contributed to a more-efficient innovation system for rural-enterprise development, as evidenced by shared use and generation of information, joint capacity building, and large-scale collaborative projects.

A community-level assessment conducted in 2007 identified 30 cases that highlight the positive impact of methods and tools used by the learning alliance on income generation, natural resource management, and the role of women. On the strength of such results, Catholic Relief Services (CRS) adopted the learning-alliance approach within its global Agriculture and Environment Program. From small beginnings in East Africa and Central America during 2002–04, CRS has extended its learning alliances for agro-enterprise development to five regions involving about 30 countries (Best et al., 2009). The approach has also been adopted in the water and sanitation sector (Smits et al, 2007) and in India's rice sector (Prasad et al., 2007).

In July 2009, the learning alliance in Central America entered a new phase. Five organizations that participated in its first phase—CRS, The Netherlands Development Organization (SNV), the Swiss Foundation for Technical Cooperation (Swisscontact), OXFAM-GB, and The Tropical Agricultural Research and Higher Education Center (CATIE, its Spanish acronym)—signed a five-year agreement to support a coordination unit that is currently facilitated by CATIE.

For more information: www.alianzasdeaprendizaje.org

Make learning alliances work at scale

What insights can be derived from the attempts described here to bridge the gap between research and development? Here's an initial list:

1. **Begin at the beginning:** Before researchers and development practitioners embark on a joint project, they should meet to discuss issues on which both can contribute insights. Once they have established a shared learning agenda, they can bring together research and development capacities more effectively and align resources throughout the project.
2. **Measure what matters consistently:** Development outcomes for the rural poor constitute the common ground between development and research organizations. In order for their collaboration to be effective, the organizations need to develop a common and consistent set of indicators and tools to track development outcomes and understand what works where, for which populations, and why. Having a common evaluation framework facilitates learning and communication between disparate actors.
3. **Invest in relationships:** Building trust is essential for effective collaboration. To have a shared learning agenda (point 1) and a common evaluation framework (point 2) helps but is not enough. Research and development organizations need to invest in opportunities for people from both sectors to share ideas through, for example, exchanges, field visits, and ongoing communication involving all concerned. These are critical parts of a learning process that motivates researchers and development practitioners to engage with one another around common issues that both need to resolve. Ultimately, learning-alliance partners must be accountable to one another as well as to their own stakeholders, and the partnership as a whole must be accountable to its stakeholders (APP, 2011).
4. **Cultivate an organizational support network:** It takes time and effort to build a shared learning culture. This is beyond the scope of a single project and requires ongoing support from staff and management in research and development organizations. To consolidate the learning culture requires a support network in both organizations, as it may run counter to short-term organizational thinking.

Many challenges must be addressed to make learning alliances sustainable. Both research and development organizations need to make significant changes in attitudes and practices while also creating clear incentives for effective learning. These organizations should also assign higher value to emerging knowledge and insights, which do not easily fit in project logical frameworks or academic journals. And they must allow for more collaboration across research and development boundaries. In addition, better documentation and measurement of results in a consistent and statistically valid manner are needed to complement current efforts focused on qualitative changes in knowledge, attitudes, skills, and practices.

The first round of learning alliances has provided useful lessons for the future, but important knowledge gaps remain. The overarching question is how to create and share knowledge within complex adaptive systems so that it contributes to sustained poverty reduction. Learning alliances and similar approaches provide opportunities to develop and test different hypotheses on this issue, which will remain an important concern for the foreseeable future.

Reaching Users through Monitoring and Evaluation

Project monitoring and evaluation (M&E) is a systematic approach to learning and capacity strengthening that involves all stakeholders (IFAD, 2001). Monitoring is periodic oversight of project implementation that seeks to establish whether the production of outputs is proceeding according to plan. Evaluation attempts to determine as systematically and objectively as possible the relevance, effectiveness, efficiency, and impact of activities in light of specified objectives. M&E is an action-oriented management tool and an organizational process for generating knowledge to improve decisions about policies, programs, and organizations (Horton et al., 2003).

Learning for enhanced adaptive capacity

Achieving eco-efficient agriculture entails complex, long-term research. Its results must inform decision-making and uptake in specific contexts while also informing further research (Watts, 2008). M&E encompasses all the channels and methods by which evidence is gathered, documented, and shared in research, including its conclusions and recommendations. M&E of research and the resulting international public goods provide crucial support for learning-by-doing and other types of learning that can enhance adaptive capacity (Douthwaite et al., 2003). Unfortunately, evaluation is often limited to the purpose of justifying past funding and obtaining future funding by demonstrating accountability and impacts, which may be disconnected from the intended users of research results.

M&E and capacity strengthening are closely linked, as both emphasize learning in research for development. It is of paramount importance for organizations to promote an "evaluative culture" through investment in evaluation for learning. They can accomplish this by encouraging people to share best practices and lessons learned, by showing appreciation for attempts at reflection, by learning from multiple sources and perspectives, and by assessing constructively past mistakes or lost opportunities.

Recommended evaluation approaches

To involve stakeholders in evaluation and through their participation to promote learning from and about evaluation should be standard practice in systemic research. Methods such as inclusive and use-focused evaluation produce better results and yield more accurate recommendations for enhancing program development and change (Bledsoe and Graham, 2005).

The main evaluation approaches currently in use are described briefly below, including comments on how M&E can be best organized and managed.

Theory-driven evaluation

With this approach—which is also known as program-theory evaluation, among other names—evaluation is based on an explicit theory or model of how programs may cause intended or observed outcomes (Rogers et al., 2000). Drawing on a synthesis of stakeholder program logic and social science theory, the approach defines what a program does and how, and gauges the effects of outputs on outcomes. This enables the evaluator to ascertain the actual causal mechanisms of program strategies and link these to changes in program participants.

Horizontal evaluation

This approach combines self-assessment with external evaluation by peers (Thiele, 2007). The two are then discussed and compared for the purpose of improving learning, communication, and sharing.

Participatory monitoring and evaluation (PM&E)

This is an action-oriented process through which stakeholders engage in monitoring or evaluation at various levels. They share control over the content, process, and results of M&E and engage in reflection, aimed at identifying corrective actions. PM&E provides ways to simplify complex plans through measurement frameworks that are owned by implementing partners. This approach not only measures the effectiveness of a project but also builds ownership of the content and promotes accountability for the outcomes at various levels (Muthoni, 2007).

Participatory learning and action (PLA)

This is an umbrella term for a wide range of methodologies, such as participatory rural appraisal, rapid rural appraisal, participatory learning methods, participatory action research, farming systems research, active method of research and participatory planning (MARP, its French acronym), and many others. The common theme in all these approaches is the full participation of people in learning about their needs and opportunities, and about actions required to address them.

Towards outcome-based evaluation

Recent evaluation methods go beyond a focus on outputs (for the sake of accountability) to examine outcomes, particularly the extent to which they reach intended users. Such methods are concerned with the impacts triggered among target groups of users during and after an intervention.

A method referred to as utilization-focused evaluation, for example, begins with the premise that evaluations should be judged by their utility (Patton, 1996). This method centers completely on the group of intended users and on the use they make of the information collected through the evaluation. Another option is outcome mapping, which does not assess the products of a program but rather focuses on changes in the behavior, relationships, and actions of the people, groups, and organizations directly involved. Then there is participatory impact pathways analysis—a planning, monitoring, and evaluation approach developed for complex projects in the water and food sectors (Álvarez et al., 2010).

These M&E methods are not yet part of standard practice in international agricultural research. However, they could gain currency if continued use demonstrates their value convincingly and if scientists adopt more widely the "innovation systems" view of agricultural research for development, as opposed to the more common linear model.

Box 5

Monitoring and Evaluation (M&E) in the Pan-African Bean Research Network (PABRA)

PABRA is a CIAT-supported research partnership that improves the productivity and nutritional quality of beans, with the aim of improving the incomes, nutrition, and food security of the rural and urban poor. PABRA employs an inclusive M&E system that reflects the complementarities and synergies that are inherent in a partnership involving national agricultural research institutes, other government organizations, NGOs, extension-service providers, and the private sector.

Based on the principles of PM&E, the PABRA system actively engages different partner groups in defining what will be evaluated, who will take part, when evaluation will take place, what quantitative and qualitative methods will be used to collect and analyze information, and how findings will be consolidated.

A PM&E facilitator guides the group through the generation of a results framework and measurement plan and also manages the group dynamics and social and political issues that arise when stakeholders having different information needs, priorities, and expectations are all involved in M&E. Some of the immediate results are a mutually defined framework for results-based management (RBM) in the form of a program logic model; a performance measurement framework, which provides guidelines for monitoring results; and review processes organized as workshops and forums.

These results provide PABRA with a platform that enables other partners in the region and beyond to participate in the alliance. PABRA's RBM framework also accommodates projects funded by specific donors, such as the work of the Sub-Saharan Africa Challenge Program on developing market, gender, and institutional arrangements for integrated research for development.

PABRA's social environment facilitates the introduction of new technologies and other innovations; its stakeholders are more tolerant of new ideas that emerge from discussions of research results and lessons learned. PABRA's member countries find it easy to replicate successful implementation of technologies and methods in other countries, thus boosting the rate at which innovations are taken up across the region.

Approaches such as participatory variety selection and private–public partnerships aimed at widening access to improved seed are still relatively new to the national institutions that are PABRA members. But some countries have quickly come to value and adopt these approaches based on reviews of case studies and lessons learned.

Where do we go from here?

Measuring research impact in a credible manner is a time-consuming and resource-intensive activity that requires specialized skills as well as research on new methodologies (CGIAR Science Council, 2009).

When M&E is done in a participatory manner focused on outcomes and learning, it can provide research managers with much useful information on the efficiency, relevance, sustainability, impact, and effectiveness of work in progress (Guijt, 1999). It can also contribute to adaptive management and improvement of a program, making it more relevant to users. The information derived from M&E offers research a "bigger picture" that reflects the complexity of any agricultural intervention. Through a continuous, inclusive, and well-organized information exchange and learning, M&E can strengthen partners' ownership of an intervention, thus increasing the chances of adoption and sustainability.

The way ahead for M&E in agricultural research concerned with eco-efficiency must involve a shift from summative evaluation driven by accountability concerns to M&E cultures and practices that are formative, inclusive, and systemic. Given growing pressures on funding and the urgency of addressing food insecurity, agricultural research must combine traditional impact assessment with more timely, affordable, and inclusive ways of learning for the future.

Strengthening Capacity through Knowledge Management and Sharing

This section underlines the contribution that knowledge management can make in strengthening capacity to make tropical agriculture more eco-efficient. It first summarizes some general trends in knowledge management and then looks into various aspects and applications of knowledge management and sharing as well as their respective tools and methods. These include: (1) participatory research communication and documentation; (2) open access to research outputs as well as to broadband telecommunications channels; (3) research project collaboration; and (4) information and communications technologies for development (ICTs4D).

Recent trends

Organizations engaged in research for development are necessarily knowledge organizations. Their core business is to combine primary information—data—with experience, context, interpretation, and reflection to generate what has been referred to as "tacit" knowledge (Nonaka, 1994). This knowledge is intended to help users make better-informed decisions and take appropriate actions.

Recent trends in knowledge management suggest that this is no longer a top-down process but rather has become a participatory activity, in which the role of management is to "make it possible for staff to act as the managers of their knowledge" (Wenger, 2004). Knowledge management has thus shifted from a managerial and technology-heavy discipline to one that centers on learning by doing and collective reflection and innovation (Hall, 2006). This shift has profound implications for the relevance of knowledge management to issues such as sustainability and equity in research for development. It has also created new opportunities to reach the intended users of new knowledge.

New opportunities for learning

Technology changes people's behavior, and new behaviors, in turn, create new contexts for technological innovation. Much the same thing happens with knowledge management.

ITU (2010) states that continuous improvement in connectivity has turned the internet into a general-purpose technology like electricity. By 2010, two billion people had access to the internet, and five billion had mobile cellular subscriptions. This has created new opportunities for providing broad access to scientific knowledge around the world. Even so, significant barriers remain, such as a lack of content in multiple languages and limited access to broadband infrastructure.

Improved connectivity has also given rise to significant progress in technology-enabled human interactivity, providing new possibilities for the online

co-creation, discussion, and promotion of content across organizational and geographical boundaries. The emergence of web 2.0 technologies has created an unprecedented entry point for practicing horizontal and decentralized communication and collaborative learning, which are crucial for multi-stakeholder and network-based activities such as agricultural research for development.

But not all knowledge management happens virtually. On the contrary, much experience and many studies suggest that face-to-face communication is crucial for creating new types of collegial relationships and fostering more creative scientific collaboration because it creates the trust and other conditions needed for effective flow of knowledge among teams and partners (Staiger et al., 2005).

Knowledge management in research for development

The scientific community has not been quick to pick up on the opportunities created by these trends. Rather, it continues to rely on a few, traditional vehicles for sharing and validating new knowledge that involve relatively poor interaction. The most important of these are experiment replication, publication of research results in peer-reviewed journals, literature searches, and formal communication at conferences and workshops.

Many scientists worry that more open and rapid sharing of research under way might not only undermine the quality of its outputs but also make it impossible to publish the results in peer-reviewed journals. These still constitute the ultimate proof of high-quality science and therefore strongly influence researchers' incentives. However, there are many promising paths for combining traditional and modern vehicles for knowledge sharing. A recent working paper from the World Bank (McKenzie and Özler, 2011), for example, shows that blogging about a scientific paper causes a massive increase in the number of times the abstract is viewed and downloaded during the month after publication.

The principles, methods, and tools of knowledge management are designed to support collective action and learning. Their application in research for development not only creates a more positive environment for eco-efficient agriculture but also enhances research impact in concrete ways by involving users. It is particularly important to mainstream and apply in all areas of agricultural research the four knowledge management applications described in the sections that follow.

Participatory research documentation and communication

Over the past five years or so, new knowledge management tools and methods have widened the horizons of research communications. Communicators and knowledge management practitioners are moving from unidirectional use of almost exclusively agricultural media towards bottom-up communications (Shaxson, 2011), using interactive media and multimedia to engage users and enhance the adoption of research results.

Social media are providing endless possibilities for stakeholder engagement. Among the most popular channels are Wikipedia (19 million articles in approximately 270 languages), YouTube for videos (48 hours of video uploaded per minute), Twitter for microblogging (one billion tweets posted per week), Facebook for social networking (500 million active users), WordPress for blogging (over 400,000 posts daily). These figures give a perspective on the potential for engaging users on almost any issue or activity.

To exploit the power of social media, one must continuously cultivate relationships and networks virtually. This involves "social media listening" (i.e., posting and replying to comments); using information technology (IT) to monitor and optimize the use of social media (e.g., search engine optimization); combining social media with traditional media (such as radio, the press, and conferences); and providing high-level content to position issues among user communities, with the aim of opening dialogue instead of trying to sell an organization or product.

The use of communications as a strategic pathway for engaging stakeholders has profound implications for an organization's web publishing strategy. Rather than just serve as a mechanism to diffuse information, the web can promote interaction and learning in relation to research processes and products. Such an approach should have these three features:

1. **A mix of media:** Content is displayed using the most convenient media (photos on Flickr, PowerPoint presentations on Slideshare, and so forth) and from there fed into corporate web sites and other media. This mix of media enhances access to the information and multiplies the possibilities for users to find it through search engines.
2. **Alternatives to "all-rights-reserved" licensing:** A key issue for online interactivity is Creative Commons licensing, which provides simple and standardized alternatives to traditional copyright. Allowing users to remix, adapt, and reuse information creates the basic conditions for knowledge to travel from one user to another, which is essential for learning and innovation.
3. **No divide between internal and external communications:** Communication must start with teams and partnerships if it is to support the whole process of multi-stakeholder research for development rather than just promote final products. Such communication implies a blurring of the boundaries between internal and external communications (Manning-Thomas and Porcari, 2010). Web sites should provide windows onto unfinished research processes that have high social engagement value (such as photos, testimonials, documentation of monitoring and evaluation processes, trip reports, and reporting on live events) and allow multiple users to post content. Password-protected information is restricted to confidential information, such as primary research databases or financial and management information.

Communication units and staff have to acquire new skills so as to incorporate social-media practices and tools into their day-to-day work and promote these among staff and partners, with explicit support from management.

Open access

Although the scientific outputs of public international research are considered global public goods, access to them may be limited for various reasons. The information may not be available in public repositories; access to it may be blocked by the copyright restrictions of peer-reviewed journals; or key information may not be available in the languages of intended users (Arivananthan et al., 2010).

Access to research outputs is the first condition for learning and capacity strengthening. The Coherence in Information for Agricultural Research for Development (CIARD) initiative indicates useful pathways and provides step-by-step guides for creating favorable institutional conditions (such as licensing) for collecting and preserving research outputs (e.g., through digitization of older outputs and use of digital repositories) and for making content widely accessible on the web (e.g., through "self-archiving," which allows publishing of the preprint or postprint of papers submitted for publication in peer-reviewed journals or conference and workshop proceedings).

Easy access to information further depends on Information Technology (IT) infrastructure and broadband Internet access. Improvements in these areas can make the internet available to all staff of an organization, better enabling them to promote its products and achievements. To create entry points for open access requires corresponding institutional policies and incentives.

Research project collaboration

Working in multidisciplinary global partnerships requires a change in individual computer work habits. Online collaborative tools (such as Google applications and wikis) and practices can be used to share work in progress, encourage regular feedback, and improve the use and reuse of information as well as to create and facilitate online communities. Recent experience demonstrates that these practices support the emergence of an ongoing learning process

(Staiger-Rivas et al., 2009). They enhance team integration, engagement, and involvement and ultimately research impact. The organizational benefits include staff empowerment, increased transparency, and stronger internal capacity, which should contribute to organizational development and change.

Whether collaborative tools thrive in an organization depends on several key factors. IT support services must be open to software solutions that are non–proprietary and must move to a technology stewardship role (Wenger et al., 2009). The adoption of collaborative online tools requires patience and careful facilitation of the change in work habits. Before collaborative web tools are introduced, their purpose must be clearly identified, and the key people involved must understand and agree with their use.

Information and communication technologies for development (ICTs4D)—site-specific eco-informatics

The emergence of the internet made possible widespread use of new ICTs4D, based on the principle of connectivity as a powerful means of inclusion (http://www.ictinagriculture.org/ictinag/content/ict-agriculture). The spread of mobile phones is rapidly overcoming barriers to access. According to ITU (2010), 86% of the world's population is covered by a mobile cellular network, and 75% of the world's rural population is covered by a mobile cellular signal.

The tools and possible applications for agriculture are limitless, including market information and financial services, land administration and risk management, advisory services, decentralized data collection, and many more. ICTs4D should contribute importantly to eco-efficiency in agriculture by providing smallholder farmers with inexpensive access to information that can help make their production more productive and competitive.

However, as often occurs with the introduction of new technology, adoption of ICTs4D has been hindered by flaws in the approach used. Initial efforts have focused too much on IT infrastructure and on access to hardware and have taken a top-down approach to information diffusion.

In order for projects involving ICTs4D to be more effective, they must meet several conditions (Rogers, 2011). First, the application must be relevant to the local context and correspond to local needs. Second, the available IT infrastructure capacity must be well understood. Third, steps must be taken from the start to ensure sustainability. And finally, applications must be developed in a participatory manner, focusing on what farmers have to offer, avoiding condescending assumptions, and providing opportunities for social learning.

In research centering on eco-efficient agriculture, ICTs4D should be a key focus for the development of applications that facilitate the creation and use of new knowledge. Several organizational changes are required to promote a knowledge sharing culture:

- A clear commitment to horizontal forms of management and related incentives. Hierarchical handling of communications and decision-making, in contrast, keeps staff from discussing research for development openly and learning from peers.
- A sustained effort to promote changes in national and regional research organizations that enhance knowledge flow between stakeholders, based on shared values and knowledge-management practices.
- A shift in the orientation of IT personnel away from technology control and towards technology stewardship, aimed at helping users choose the best technologies, including those needed to foster knowledge sharing.

These changes are critical for strengthening capacity to achieve eco-efficient agriculture through active knowledge management and sharing in research for development.

The Way Forward

This chapter has examined various approaches by which stakeholders can mainstream eco-efficiency

in the agricultural development agenda. To achieve this transformation will require a multidisciplinary effort to build innovation capacity through joint learning and stakeholder empowerment.

One of the chapter's key assumptions is the need for a systemic approach to research for development that acknowledges the complexity of research and of the interactions between those involved. Creating the institutional arrangements needed for such an approach is a huge challenge. How can organizations incorporate the notion of eco-efficiency into their work? How can they learn and adapt continuously? How can they handle complex processes and interactions efficiently? How can they walk their talk? Horton (2012) spells out the institutional changes that are required:

Becoming a learning organization frequently requires: shifting from closed innovation strategies to more open ones; shifting from simple, hierarchical organizational designs to more complex ones that feature multidisciplinary teamwork and multi-organizational collaboration; shifting from traditional planning and implementation systems to adaptive management; expanding evaluation functions to encompass both accountability and learning; and incorporating societal concerns and priorities into performance incentives.

Eco-efficiency starts at home

As agricultural research organizations begin to mainstream eco-efficiency, they can start by examining their internal capacities, policies, administrative processes, incentive structures, and other organizational arrangements. Suggested steps are to:

- Develop a good understanding of eco-efficiency internally through training, workshops, field visits, and seminars.
- Adopt appropriate business practices and policies, such as carbon-footprint standards and eco-efficient practices in office-space design, renovation, construction, landscaping, and supply-chain management.
- Widen staff skills to include new capacities in areas such as facilitation, mentoring, networking, and social media. These are essential for working with diverse stakeholders to identify and develop new opportunities for technical and institutional innovation (Horton, 2012).
- Use monitoring and evaluation methods and tools for learning and adaption in conjunction with traditional approaches centering on accountability and return on investment.
- Design incentives (such as appraisal criteria, competitions, rewards, and small grants) to promote teamwork, open knowledge sharing, and a practical focus on development results.
- Allow for adaptive management (Horton, 2012) in terms of planning, budgeting, reporting, and career development.

Organizations that take these steps can strengthen their capacity for innovation through a combination of bottom-up and top-down approaches, involving dialogue between staff, partners, and other stakeholders. Such organizations can learn from past experience and make better decisions that focus their research more sharply on development outcomes, leading to eco-efficient agriculture.

References

Almekinders C; Hardon J; Guevara F, eds. 2006. Un nuevo respeto para los agricultores: experiencias en fitomejoramiento participativo y los desafíos para su institucionalización. Agromisa especial no. 5. Agromisa, Wageningen, the Netherlands. p 147.

Álvarez S; Douthwaite B; Thiele G; Mackay R; Córdoba D; Tehelen K. 2010. Participatory impact pathways analysis: a practical method for project planning and evaluation. Development in Practice 10(8):946–958.

APP (Africa Progress Panel). 2011. Africa progress report: The transformative power of partnerships. Geneva, Switzerland. (Also available at: www.africaprogresspanel.org/files/7713/0441/3939/APP_APR2011_FINAL.pdf)

Arivananthan M; Ballantyne B; Porcari EM. 2010. Benchmarking CGIAR research outputs for availability and accessibility. Agricultural Information Worldwide 3(1):17–22. (Also available at: http://journals.sfu.ca/iaald/index.php/aginfo/article/view/35/51)

Ashby J. 1985. Los efectos de los diferentes tipos de participación del agricultor en el manejo de ensayos a nivel de finca. Proyecto Fósforo IFDC/CIAT. Working document. 22 p.

Ashby J; Braun A; Gracia T; Guerrero M del P; Hernández LA; Quirós CA; Roa JI. 2001. La comunidad se organiza para hacer investigación: experiencias de los comités de investigación agrícola local, CIAL, en América Latina. CIAT, Cali, Colombia. 206 p.

Ashby J; Hareau G; Quirós CA; Thiele G. 2009. The impact and experience of participatory plant breeding in Latin America. Paper presented at "Tropical roots and tubers in a changing climate: a convenient opportunity for the world"—15th Triennial Symposium of the International Society for Tropical Root Crops, 2–6 November 2009. International Potato Center, Lima Peru. www.cipotato.info/docs/abstracts/SessionX/OP-76_J_Ashby.pdf

Best R; Ferris S; Mundy P, eds. 2009. Working Together, Learning Together: Learning Alliances in Agro-enterprise development. Catholic Relief Services, Baltimore, MD, USA. (Also available at: http://pdf.usaid.gov/pdf_docs/PNADQ286.pdf)

Bledsoe K; Graham JA. 2005. Using multiple evaluation approaches in program evaluation. American Journal of Evaluation 26(3):302–319.

Braun A; Hocdé H. 2003. Farmer participatory research in Latin America: Four Cases. In: Stur WW; Horne PM; Hacker JB; Kerridge PC, eds. Working with farmers: the key to adoption of forage technologies. ACIAR Proceedings 95. Australian Centre for International Agricultural Research, Canberra. p 32–53. (Also available at: http://aciar.gov.au/publication/PR095)

Cárdenas G; Gloria I. 2009. Investigación participativa con agricultores: una opción de organización social campesina para la consolidación de procesos agroecológicos. Revista luna azul, Universidad de Caldas, Manizales, Colombia.

Catavassi R; Gonzales M; Winters P; Andrade-Piedra J; Espinosa P; Thiele G. 2009. Vinculando a pequeños productores a la nueva economía agrícola: una evaluación del programa plataformas en el Ecuador. Documento de Trabajo de ESA no. 09-06, Dirección de Economía del Desarrollo Agrícola. FAO, Rome. (Also available at: ftp://ftp.fao.org/docrep/fao/012/ak482s/ak482s00.pdf)

Ceccarelli S; Grando S; Tutweiler R; Baha J; Martini A; Salaheih H; Goodchild A; Michael M. 2000. A methodological study on participatory barley breeding. Euphytica 111:91–104.

CGIAR. 2006. The CGIAR's 2006 stakeholder perceptions survey: summary report for respondents. www.cgiar.org/pdf/cgiar_stakeholder_perception_survey_Respondent_Report_2006_GS.pdf

CGIAR. 2008. The future of partnerships in the CGIAR: report of Working Group 2 (Partnerships) to the Change Steering Team of the CGIAR. www.cgiar.org/changemanagement/pdf/wg2_FutureofPartnerships_FINAL_aug11_2008.pdf

CGIAR Science Council. 2009. Monitoring and evaluation: processes and experiences. 17 p. www.sciencecouncil.cgiar.org/fileadmin/user_upload/sciencecouncil/Highlights/ME-processes_20and_20experiences_20SC-April_202009.pdf

CGIAR. 2011. A strategy and results framework for the CGIAR. http://www.cgiarfund.org/sites/cgiarfund.org/files/Documents/PDF/srf_feb20_2011.pdf

Classen L; Humphries S; Fitzsimons J; Kaaria S; Jimenez J; Sierra F; Gallardo O. 2008. Opening participatory spaces for the most marginal: learning from collective action in the Honduran hillsides. World Development 36(11):2402–2420.

CORPOICA (Corporación Colombiana de Investigación Agropecuaria). 2002. Primeros frutos de la investigación participativa con agricultores en CORPOICA. Bogotá.

CRS (Catholic Relief Services). 2007. Preparing farmer groups to engage successfully with markets. A field guide for five key skill sets. CRS, Baltimore, MD, USA; The Rural Innovation Institute, CIAT, Cali, Colombia. 34 p. (Also available at: http://crs.org/publications/showpdf.cfm?pdf_id=14)

Douthwaite B; Delve R; Ekboir J; Twomlow S. 2003. Contending with complexity: the role of evaluation in implementing sustainable natural resource management. International Journal of Agricultural Sustainability 1(1):51–63.

Dunn ES. 1971. Economic and social development: a process of social learning. Johns Hopkins University Press, Baltimore, MD, USA.

Ekboir J; Sette C. 2010. Breakthrough partnerships: ILAC's contribution to the change process in the CGIAR. Institutional Learning and Change Initiative, Rome, Italy.

FAO (Food and Agriculture Organization of the United Nations). 2011. The state of food and agriculture 2010–11: women in agriculture—closing the gender gap for development. FAO, Rome.

Friedmann J. 1984. Planning as social learning. In: Korten DC; Klauss R, eds. People centred development: contributions toward theory and planning frameworks. Kumarian Press, West Hartford, CT, USA.

Fukuda W; Saad N. 2001. Participatory research in cassava breeding with farmers in northeastern Brazil. Working Document No. 14. CGIAR Systemwide Program on Participatory Research and Gender Analysis for Technology Development and Institutional Innovation, Cali, Colombia. 42 p.

GFAR (Global Forum on Agricultural Research). 2010. The GCARD roadmap: transforming agricultural research for development (AR4D) systems for global impact. www.egfar.org/egfar/digitalAssets/3757_The_GCARD_Road_Map_draft12-12-10.pdf

Goncalves F, WM; Saad N. 2001. Investigación participativa en el mejoramiento de yuca con agricultores del Nordeste de Brasil. Documento de trabajo CNPMF No. 98. Brazilian Agricultural Research Corporation (Embrapa), Cruz das Almas, BA, Brasil. 44 p.

Guijt I. 1999. Participatory monitoring and evaluation for natural resource management and research. Socio-economic Methodologies for Natural Resources Research. Natural Resources Institute, Chatham, UK.

Hall A. 2006. New insights into promoting rural innovation: learning from civil society organisations about the effective use of innovation in development—final technical report. www.dfid.gov.uk/r4d/PDF/Outputs/Misc_Crop/R8372FinalReport.pdf

Hall AJ; Yoganand B; Crouch JH; Clark NG. 2004. The evolving culture of science in the Consultative Group on International Agricultural Research: concepts for building a new architecture of innovation in agri-biotechnology. In: Hall AJ; Yoganand B; Sulaiman RV; Rajeswari Raina S; Shambu Prasad C; Naik Guru C; Clark NG, eds. Innovations in innovation: reflections on partnership, institutions and learning. Crop Post-Harvest Programme; International Crops Research Institute for the Semi-Arid Tropics, Patancheru, Andhra Pradesh, India; National Centre for Agricultural Economics and Policy Research, New Delhi. 252 p. (Also available at: http://ec2-50-19-248-237.compute-1.amazonaws.com/451/1/InnovationsInInnovation.pdf)

Horton D; Alexaki A; Bennet-Lartey S; Noële Brice K; Campilan D; Carden F; de Souza Silva J; Thanh Duong L; Khadar I; Maestrey Boza A; Kayes Muniruzzaman I; Perez J; Somarriba Chang M; Vernooy R; Watts J. 2003. Evaluating capacity development: experiences from research and development organizations around the world. ISNAR, IDRC & CTA. 188 p. (www.idrc.ca/en/ev-31556-201-1-DO_TOPIC.html)

Horton D; Prain G; Thiele G. 2009. Perspectives on partnership: a literature review. Working paper 2009-3. International Potato Center, Lima, Peru. 112 p. www.cgiar-ilac.org/files/workshops/Partnership/Resources/Horton_Perspectives.pdf

Horton D. 2012. Organizational change for learning and innovation. Thematic Note 5, Module 4: Agricultural research within an agricultural innovation system. In: World Bank. Agricultural innovation systems: an investment sourcebook. Agriculture and Rural Development. World Bank, Washington, DC.

ILAC (Institutional Learning and Change Initiative). 2010. Interview with Robert Chambers. http://www.cgiar-ilac.org/content/audio-files

IFAD (International Fund for Agricultural Development). 2002. Managing for impact in rural development: a guide for project M&E. IFAD, Rome.

ITU (International Telecommunications Union). 2010. World Telecommunication/ICT Development Report 2010: monitoring the WSIS targets–a mid-term review. Geneva. (Also available at: www.itu.int/ITU-D/ict/publications/wtdr_10/)

Kerr R; Snapp S; Chirwa M; Shumba L; Msachi R. 2007. Participatory research on legume diversification with Malawian smallholder farmers for improved human nutrition and soil fertility. Experimental Agriculture 43:437–453.

Kristjansen P; Reid R; Dickson N; Clark W; Romney D; Puskur R; MacMillan S; Grace D. 2009. Linking international agricultural research knowledge with action for sustainable development. PNAS 106(13):5047–5052.

Leeuwis C. 2004. Communication for rural innovation: rethinking agricultural extension. Blackwell Science, Oxford, UK.

Leeuwis C; Pyburn R. 2002. Social learning for rural resource management. In: Leeuwis C; Pyburn R, eds. Wheelbarrows full of frogs: social learning in rural resource management. Van Gorcum, Assen, The Netherlands. p 11–21.

Lundy M; Gottret MV; Ashby J. 2005 Learning alliances: an approach for building multi-stakeholder innovation systems. ILAC Brief 8. www.cgiar-ilac.org/files/publications/briefs/ILAC_Brief08_alliances.pdf

Manning-Thomas N; Porcari E. 2010. CIARD activities in the CGIAR: final report. http://mahider.ilri.org/bitstream/10568/3089/1/CIARDCGIARGrantFinalReport.pdf

Mazon O, N; Peralta I, E; Murillo I, A; Falconi C, E; Monar B, C; Subía G, C; Estrella S, P; Pinzón Z, J. 2007. Comités de investigación agrícoloa local (CIALs): herramienta para generar capacidades locales en investigación y desarrollo—avances en communidades de las provincias Carchi, Imbabura y Boliva, Ecuador. Programa nacional de leguminosas de grano. Publicación miscelánea No. 137. INIAP, Quito, Ecuador.

McKenzie D; Özler B. 2011. The impact of economics blogs. Policy Research Working Paper 5783. World Bank, Washington, DC. (Also available at www-wds.worldbank.org/external/default/WDSContentServer/IW3P/IB/2011/08/29/000158349_20110829130036/Rendered/PDF/WPS5783.pdf)

Mehta-Bhatt P; Beniest J. 2011. Report of the project on: 'Collective action in CGIAR capacity development'. Capacity Development Unit, International Livestock Research Institute, Nairobi. 85 p.

Milbrath LW. 1989. Envisioning a sustainable society: learning our way out. State University of New York Press, New York, NY, USA.

Muthoni R. 2007. Building capacity in participatory monitoring and evaluation in NARES. CIAT in Africa Highlights No. 36. 2 p. International Center for Tropical Agriculture, Cali, Colombia.

Nonaka I. 1994. A dynamic theory of organizational knowledge creation. Organization Science 5(1):14–37.

Özgediz S; Nambi A. 1999. Partnerships and networks: definition, forms and critical success factors. Paper presented at the International Workshop on Partnerships (coordinated by WARDA and ISNAR), 8–10 December. Bouake, Côte d'Ivoire.

Patton M. 1996. Utilization-focused evaluation: the new century text, 3rd edn. Sage, Thousand Oaks, CA, USA.

Prasad SC; Beumer K; Mohanty D. 2007. Towards a Learning Alliance: SRI in Orissa. Xavier Institute of Management, Bhubaneswar, and WWF-ICRISAT Dialogue on Water, Food and Environment, Patancheru (http://ciifad.cornell.edu/SRI/countries/india/SRIinOrissa07.pdf)

Rogers C. 2011. The top 7 reasons why most ICT4D projects fail. Video: http://www.youtube.com/watch?v=wLVLh0L7qJ0.

Rogers P; Hacsi T; Petrosino A; Huebner T, eds. 2000. Program theory in evaluation: challenges and opportunities. New Directions for Evaluation, 87. Jossey-Bass, San Francisco, CA, USA.

Röling N. 1992. The emergence of knowledge systems thinking: a changing perception of relationships among innovation, knowledge and configuration. Knowledge and Policy 5(1):42–64.

Shaxson L. 2011. Improving the impact of development research through better research communications and uptake. Background paper for the AusAID, DFID, UKCDS funded workshop: London, November 29th and 30th 2010. www.dfid.gov.uk/R4D/PDF/Outputs/Communication/AusAID-DFID-workshop-background-paper-FINAL.pdf

Smith J; Chataway J. 2009. Learning from the periphery: The CGIAR and civil society partnerships. Innogen working paper No. 72. www.cgiar-ilac.org/files/Smith_Learning.pdf

Smits R. 2002. Innovation studies in the 21st century: questions from a users' perspective. Technological Forecasting and Social Change 69(9):861–883.

Smits S; Moriarty P; Sijbesma Ch, eds. 2007. Learning alliances: scaling up innovations in water, sanitation and hygiene. Technical Paper No. 47. IRC International Water and Sanitation Centre, Delft, The Netherlands. 174 p.

Spielman D; Hartwich F; von Grebmer K. 2007. Sharing science, building bridges, and enhancing impact: public–private partnerships in the CGIAR. IFPRI Discussion Paper 708. International Food Policy Research Institute, Washington, DC.

Staiger S; Russell N; Hewlitt A. 2005. Making the most of major meetings: an entry point for knowledge sharing. ILAC Brief 10. http://ageconsearch.umn.edu/bitstream/52519/2/ILAC_Brief10_meetings.pdf

Staiger-Rivas S; Shelton P; Kosina P; White N. 2009. Working in virtual environments: three practical collaborative web tools. ILAC Brief 23. www.cgiar-ilac.org/files/ILAC_Brief23_Virtual_Environments.pdf

Tennyson R. 2003. Institutionalising partnerships: lessons from the front line. In focus 8. International Business Leaders Forum, London. (Also available at: www.toolkitsportdevelopment.org/html/resources/0C/0CC00F20-85F6-4484-AB28-7D428002C84C/Infocus8.pdf

Thiele G. 2007 Horizontal evaluation: fostering knowledge sharing and program improvement within a network. American Journal of Evaluation 28:493–508.

Van Mele P; Wanvoeke J; Zossou E. 2010. Enhancing rural learning, linkages and institutions: the rice videos in Africa. Development in Practice. 20:414–421.

Watts J; Lilja N; Kristjanson P; Horton D. 2008. Rethinking impact evaluation: lessons from international agricultural research and development. Paper presented at "AEA 2008: Evaluation and Learning," 5–8 November 2008. Denver, Colorado, USA. http://sites.google.com/site/rtdaea/2008-576-Watts_J-Rethinking.pdf

Wenger E. 2004. Knowledge management as a doughnut: shaping your knowledge strategy through communities of practice. Ivey Business Journal. 8 p. www.knowledgeboard.com/download/1890/Knowledge-management-as-a-doughnut.pdf.pdf

Wenger E; White N; Smith J. 2009. Digital habits: stewarding technology for communities. CPSquare, Portland, OR, USA. 218 p.

Woodhill J. 2002. Sustainability, social learning and democratic imperative. In: Leeuwis C; Pyburn R, eds. Wheelbarrows full of frogs: social learning in rural resource management. Van Gorcum, Assen, The Netherlands. p 317–332.