Study on impacts of farmer-led research supported by civil society organizations

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Aquatic Agricultural Systems

STUDY ON IMPACTS OF FARMER-LED RESEARCH SUPPORTED BY CIVIL SOCIETY ORGANIZATIONS

Authors

Chesha Wettasinha (coordinator), Ann Waters-Bayer, Laurens van Veldhuizen, Gabriela Quiroga and Kees Swaans

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Front cover: CIAL plant breeders, Honduras (Photo credit: Omar Gallardo/FIPAH)
Back cover: Yacouba Sawadogo digs *zaï*, Burkina Faso (Photo credit: Chris Reij/World Resources Institute)

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In the course of this study, we contacted numerous individuals (see Annex D) who provided us with documents and other information on the different cases. Their comments on drafts of the case studies were particularly useful, and they also helped to include more recent data on the cases. We gratefully acknowledge their valuable contributions to this study.

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We hope that this study will inspire many more people — not only those involved in informal innovation processes on the ground, but also those involved in the formal agricultural research and development sector — to take out-of-the box approaches to their work and to form partnerships with each other for mutual learning in working toward the common goal of helping smallholder farmers improve their livelihoods.

The study team

CONTENTS

LIST OF ACRONYMS

AAS	Aquatic Agricultural Systems
ACIAR	Australian Centre for International Agricultural Research
ACORDE	*Asociación Coordinadora de Recursos para el Desarrollo* (Association of Resource Management for Development)
ADAF-Gallè	*Association pour le Développement des Activités de Production et de Formation* (Association for Development of Production and Training Activities)
AgREN	Agricultural Research and Extension Network
Agritex	Department of Agricultural Technical and Extension Services
AME	Agriculture, Man, Ecology
AOPP	*Association des Organisations Professionnelles Paysannes* (Association of Professional Smallholder Organisations)
AS-PTA	*Agricultura Familiar e Agroecologia* (Family Farming and Agroecology)
ASE	AgriService Ethiopia
ATVET	Agricultural, Technical, Vocational and Educational Training
BASED	Broadening Agricultural Services and Extension Delivery
CASADD-VR	*Centre d'Action pour la Securité Alimentaire, le Développement Durable et la Valorisation des Ressources* (Center for Action toward Food Security, Sustainable Development and Resource Enhancement)
CCAFS	Climate Change, Agriculture and Food Security
CEDAC	Cambodian Centre for Study and Development in Agriculture
CIAL	*comité de investigación agrícola local* (local agricultural research committee)
CIAT	*Centro Internacional de Agricultura Tropical* (International Center for Tropical Agriculture)
CIMMYT	*Centro Internacional de Mejoramiento de Maíz y Trigo* (International Maize and Wheat Improvement Center)
CIRAD	*Centre de Coopération Internationale en Recherche Agronomique pour le Développement* (French Centre for International Cooperation in Agricultural Research for Development)
ConTill	Conservation Tillage Research Project
COSECHA	*Asociación de Consejéros para una Agricultura Sostenible, Ecologica y Humana* (Association of Advisors for Sustainable, Ecological and People-Centered Agriculture)
CoS–SIS	Convergence of Sciences–Strengthening Innovation Systems
CRP	CGIAR research program
CRS	Catholic Relief Services
CSO	civil society organization
CTA	Technical Center for Agricultural and Rural Cooperation
DFID	Department for International Development
DRC	Democratic Republic of the Congo
ETSP	Extension and Training Support Project
FAO	Food and Agriculture Organization of the United Nations
FARM–Africa	Food and Agricultural Research Management in Africa; now Farm Africa
FFS	farmer field school
FIPAH	*Fundación para la Investigación Participativa con Agricultores de Honduras* (Foundation for Participatory Research with Honduran Farmers)
FPR	farmer participatory research
GFAR	Global Forum for Agricultural Research

GIZ	*Deutsche Gesellschaft für Internationale Zusammenarbeit* (German Agency for International Cooperation); formerly *Deutsche Gesellschaft für Technische Zusammenarbeit* (GTZ)
IDRC	International Development Research Centre
IER	*Institut d'Économie Rurale* (Rural Economy Institute)
IFAD	International Fund for Agricultural Development
IFOAM	International Federation of Organic Agricultural Movements
IFPR	Institutionalisation of Farmer Participatory Research
IIED	International Institute for Environment and Development
IIRR	International Institute of Rural Reconstruction
ILEIA	Information centre for Low-External-Input and sustainable Agriculture
INADES	*Institut Africain pour le Développement Économique et Social* (African Institute for Economic and Social Development)
INERA	*Institut de l'Environnement et de Recherches Agricoles* (Institute for Environmental and Agricultural Research)
IPC	*Investigación Participativa en Centroamérica* (Participatory Research in Central America)
IPM	integrated pest management
ISWC	Indigenous Soil and Water Conservation
ITDG	Intermediate Technology Development Group; now Practical Action
JOLISAA	Joint Learning in Innovation Systems in African Agriculture
LEISA	low external input and sustainable agriculture
LI-BIRD	Local Initiatives in Biodiversity, Research and Development
LISF	Local Innovation Support Fund
MASIPAG	*Magasaka at Siyentipiko para sa Pag-unlad ng Agrikulutura* (Farmer-Scientist Partnership for Agricultural Development)
NGO	nongovernmental organization
ODI	Overseas Development Institute
PAEPARD	Platform for African-European Partnership on Agricultural Research for Development
PATECORE	*Projet Aménagement des Terroirs et Conservation des Ressources dans la Plateau Central* (Project for Land Management and Resource Conservation on the Central Plateau)
PID	participatory innovation development
POFT	participatory on-farm trial
PRA	participatory rural appraisal
PROFEIS	Promoting Farmer Experimentation and Innovation in the Sahel
PROLINNOVA	PROmoting Local INNOVAtion in ecologically oriented agriculture and natural resource management
PTD	participatory technology development
R&D	research and development
SDC	Swiss Agency for International Development and Cooperation
SEDEPAC	Service for Development and Peace
SRI	System of Rice Intensification
SNNPRS	Southern Nations, Nationalities and Peoples Regional State (also referred to as Southern Region)
SYDIP	*Syndicat de Défense des Intérêts Paysans* (Union for the Defense of Farmers' Interests)
UCA	Ukiriguru Composite A
UNAG	*Unión Nacional de Agricultores y Ganaderos* (National Farmers and Cattle Ranchers Union)

EXECUTIVE SUMMARY

Decades of scientific research related to agriculture and natural resource management have brought limited benefits to smallholder farmers, including crop farmers, fishers, livestock keepers and other resource users. Therefore, donors, policymakers and civil society organizations (CSOs), such as farmer organizations and nongovernmental organizations (NGOs), are urging the formal research sector to make its work more useful to smallholder farmers. Many institutions of agricultural research and development are now seeking ways to engage more closely with smallholders in order to conduct research that is more relevant for and accessible to them, and are seeking examples and good practices as sources of learning. Some examples of research that is focused on smallholders and in which the process is co-managed and driven by smallholders can be found in "informal" research initiatives — specifically, those which are facilitated by CSOs. However, information on these initiatives rarely finds its way into the realm of scientific literature and is therefore not readily accessible to formal research institutions. The purpose of this study was to identify such examples of informal agricultural research and development that could be documented and thus made accessible to formal researchers.

The CGIAR Research Program on Aquatic Agricultural Systems (AAS) pursues an approach that involves embedding research within development processes and strengthening stakeholders' capacities to innovate and adapt. The AAS program, together with the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), asked PROLINNOVA[1] — an NGO-led multistakeholder international network that promotes local innovation processes in agriculture and natural resource management — to help them explore the approaches, outcomes and impacts of informal research and development facilitated by CSOs. Basing their research on 11 case studies from Africa, Asia and Latin America, which were drawn from over 100 cases that were identified and vetted, the study team assessed the extent to which farmer-led processes of research and innovation in agriculture and natural resource management led to improvements in rural livelihoods.

This report describes farmer-led research findings and their dissemination, and analyzes available evidence on the impact of farmer-led approaches to agricultural research and development[2] on rural livelihoods, local capacity to innovate and adapt, and influence on governmental institutions of agricultural research and development. It then draws lessons for pursuing this type of approach and for future partnerships between actors in both formal and informal agricultural research and development who seek common goals in serving smallholder communities.

Outcomes and impact of farmer-led research

Farmer-led research led to various findings, innovations and adaptations. Technological innovation featured prominently. Most of the examples were techniques related to land improvement, soil and water conservation, crop production, and crop and animal protection. Documented examples of techniques for storing and processing produce and for livestock husbandry were much fewer. Innovations related to social, institutional and organizational aspects rarely emerged in the cases.

Documentation and dissemination of the farmer-led process and results took place in many different ways. In most cases, CSOs supported the farmers in keeping records, but the data were not always systematically analyzed or were incomplete. Sometimes, the farmers' findings were disseminated to other farmers or shared with an international readership through papers and articles. NGOs that were seeking to integrate farmer-led research approaches into governmental institutions documented and spread the process and lessons from using the approach, but included little in the documentation about the results of the farmer-led research. The most common ways of sharing farmers' findings were orally from farmer to farmer through informal networks and through deliberately created opportunities for farmer-experimenters and other farmers to meet and share. Innovations that required no or few external inputs and brought obvious benefits spread quickly in an informal way, but there were limits to such spontaneous dissemination.

The impacts of farmer-led research on rural livelihoods were diverse. There appeared to be greater food and nutrition security through improved production, better storage and increased crop diversity. Improved agrobiodiversity reportedly led to greater resilience to environmental hazards or pests and diseases. Farmer-led research often led to higher yields and household incomes compared to previous farming techniques, and allowed farmers to accumulate savings and to invest in assets. Most of the research involved reduced use of chemical inputs and had a positive environmental impact. There was relatively little documentation of community-level impacts.

Experimentation, especially with introduced technologies, tended to bring more benefits to medium and better-off farmers than to poorer households, especially women-headed ones. Experimentation based on endogenous innovation using local resources appeared to be more relevant for the poorer households. Often, innovations were location-specific and could not be scaled up easily. What could be scaled up was the approach of encouraging farmers to experiment, but some external evaluators missed this aspect. The monitoring and evaluation process was generally weak, with little systemic collection and analysis of data.

Another important area of impact was farmers' capacity to continue the process of innovation to address other challenges. Strengthening individual capacities, such as confidence, knowledge and skills to handle experimentation and innovation, is a key feature mentioned in all cases. Men and women farmers are being recognized as innovators by their farming peers and by external research and development actors. Many farmer-experimenters became skilled facilitators and trained and supported others. Local organizational capacity was also strengthened as a result of farmers working and learning in groups — initially for experimentation and later for other activities, such as marketing, labor-sharing, savings and credit, and lobbying for the rights of smallholders in research and development. Farmers became more capable of identifying and linking up with relevant sources of information and support organizations. Several cases show that creating spaces for social learning can enhance innovation capacity, but there is little information as to whether this led to continued processes of innovation after the interventions by CSOs ended.

The farmer-led research approaches described in the cases have led to changes in both governmental and civil society institutions, including agricultural research and extension agencies at different levels, educational institutions, NGOs, farmer organizations, and community-based organizations. In six cases, the main path for institutionalization was through governmental institutions; the other five cases focused on the informal research and development sector. Analysis reveals that institutionalization through the formal sector has been slow and has had limited success. Although some changes in mindsets, skills and knowledge were observed among staff, none of the cases reported significant changes in the structures and working mechanisms of these organizations or in their budget allocations. NGOs, community-based organizations, and farmer organizations and movements appear to have been more open and receptive to integrating farmer-led participatory approaches.

Lessons learned

From the specific cases, several lessons were drawn that could have a wider application.

The process of and support to farmer-led research. Explicit attention needs to be given to not only "hard" (biotechnical) but also "soft" (socio-institutional) innovation. Smallholders develop innovations that can inspire and be applied by others, but many low-cost, low-risk innovations are not easily recognized by farmers and formal research and development actors. Outsiders tend to identify more technological than socio-institutional innovations. In the cases analyzed, when farmers were encouraged to work in several small groups, they could tackle a wide diversity of topics, responding to heterogeneous needs in the community. This also tended to lead to some form of sustained communication among group members even after the intervention ceased. Activities that brought "early wins" sustained the enthusiasm and motivation of farmers to experiment and engage

in longer-term research. Poor farmers, in particular, found endogenous innovations using locally available resources relevant to their needs. Providing new external technologies and ideas without exact specifications gave the farmers flexibility and space to experiment and adapt. The cases also showed that introduced approaches to stimulating and facilitating farmer-led research must be adapted in each country and need to be constantly improved through critical reflection.

Sharing and spreading results. Farmer-led research often results in location- and household-specific interventions, but can still give ideas to and encourage other farmers by showing how households under similar conditions managed to address their problems. Locally relevant innovation can spread quickly and spontaneously, though this is rarely monitored. More attention should be given to spreading results through farmer-to-farmer extension, national symposia for farmer-researchers and farmer innovation fairs. However, this should not exclude disseminating information about the process of joint experimentation and learning. It should be considered whether restricting intellectual property rights to certain types of locally developed technologies is amenable to stimulating innovation processes.

Scaling out the process. In addition to scaling out specific innovations, efforts are needed to scale out the process of farmer-led research so that it is practiced by a large number of farmers and other research and development actors over a wider area. Farmer-led research approaches can have long-term impact in terms of farmers' increased capacity to investigate, experiment and share knowledge. However, it appears to be important to start small, gain experience and scale out gradually, seeking to stimulate farmers' curiosity instead of trying to perfect their research capacities. Farmer-led research can both generate and harvest social energy, so that people are willing to move beyond individual or household gains and engage in activities that benefit others in their community.

Scaling up farmer-led research as an approach. Scaling up or institutionalizing farmer-led research involves building the capacity of different stakeholders and their organizations to apply the approach as part of their regular work. It is a complex process that requires capacity strengthening and change in individuals and, through them, change in organizations. Some cases were primarily aimed at embedding the farmer-led approach within formal research and development institutions in the country. This required broad multistakeholder alliances and a clear strategy. When farmer-led research approaches are being introduced into governmental services, care must be taken to embed the approaches in the organizations so that the underlying principles of these approaches are embraced and practiced by all staff at all levels. This poses challenges, as learning within governmental organizations is often weak on account of high staff turnover and frequent administrative restructuring and changes in policy. There may be greater opportunities to embed and sustain farmer-led research approaches within informal-sector institutions such as community-based and farmer organizations and informal farmer networks. Where governmental structures and policies are not conducive, the most promising pathway for institutionalizing the ideas, principles and spirit of farmer-led research approaches is probably through such less formal structures.

Gender and other equity issues. There should be a conscious and consistent effort to deal with gender and other disparities within farmer-led research approaches. Tagging a process as "participatory" does not automatically lead to men and women having equal opportunity to take part. In addition to gender-conscious facilitation, timely and pertinent socio-economic assessments, close observation, and continuous adjustments can also make the farmer-led methodology more inclusive and can open up spaces for marginalized groups, including women.

Roles of formal agricultural research, advisory services and education. Useful innovation in farming is happening without inputs from formal science. However, scientists can play an important role by sharing their knowledge and skills, building the capacity of farmers in selected aspects of experimentation, helping farmers understand why something is working or not, documenting what farmers are doing and sharing these experiences widely, and validating technologies in scientific terms to increase credibility in the formal research and development sector. In the case of complex

experiments in CSO-facilitated farmer-led research, scientists could help farmers recognize which factors affect outcomes and could systematize results from the trials. Agricultural advisory services can contribute in linking farmers with a wide range of relevant sources of information and support agencies. To the extent that farmer-led research approaches are integrated into decentralized plans of formal research and development, it would be advisable to make a budget available to support farmers' experiments. If agricultural researchers and advisors are to play these new roles, farmer-led research needs to be integrated into agricultural education and training.

Roles of civil society organizations. CSOs play a strong role in capacity development for farmer-led research, including strengthening of both technical and socio-organizational skills. Some NGOs have invested in training paraprofessionals to take over their roles in promoting farmer-led research and development. Encouragement provided by national and local organizations of smallholder farmers can help in spreading a farmer-led research approach. The role of social capital — motivation, trust, networking capacity and ownership — in the process should not be underestimated. It is this quality that may make such approaches more successful in the CSO sector than in formal agricultural research and development. Where the political conditions allow, the farmer organizations and NGOs can form networks and use their experiences in policy dialogue and advocacy to maintain or expand the space to continue this approach.

Roles of funding agencies. In most of the cases analyzed, external funding had been provided to initiate or strengthen the CSO-facilitated farmer-led research process. The volume and modalities of funding, however, differed substantially. They tended to be much higher in cases where the CSO was trying to institutionalize a farmer-led research approach rather than apply it at a grassroots level in a limited geographic area. External funding proved to be particularly important in the case of longer-term farmer-led research that brings returns only after several years. Long-term commitment of donors that recognize the value of a farmer-led research approach helped farmers to slowly but surely build up the capacity of their networks. Prevailing mechanisms for external funding of farmer-led research processes are oriented toward project cycle management, which can constrain the flexibility and creativity of partners in the innovation process. Donors that would like to support the institutionalization of farmer-led research within governmental structures should be prepared to give much more time — not necessarily higher levels of funding — to achieve this.

Strength of evidence and analysis

The analysis relied heavily on gray literature and resource persons, but it was not always possible to find informed insiders or the relevant information for writing up the case studies. Little evidence was found on costs of farmer-led research approaches, and none of the identified cases included an explicit theory of change. Criteria related to the quality of documented evidence of impact were the most difficult to meet. In only a few cases could evaluation or impact assessments be found that were made by people external to the process. Some external impact assessments were made immediately after projects ended, but not several years later, which would be more meaningful. If CSOs want to have solid evidence to advocate for wider application of farmer-led research approaches, they need to pay much more attention to high-quality documentation of outputs, outcomes and impacts, preferably including independent evaluators in the impact assessment.

An aspect that would have deserved more scrutiny and categorization in the analysis is the degree to which the approaches identified as farmer-led research were indeed farmer-led; in some cases, supporting NGOs appeared to play a fairly strong role in suggesting innovations to explore. Another issue not given sufficient attention was which type of farmers took the lead in the research. Available documentation about process did not delve into power issues within farming communities and organizations and between these and external actors. "Empowerment" of farmers and communities was often mentioned, but what this meant in terms of shifts in relative influence and new types of conflict was not discussed in any detail.

Because of time restrictions, the analysis was focused on the 11 case studies selected and could not capture insights and evidence from the rest of the cases in the long list selected from over 100 cases.

Suggestions for follow-up and further investigation

The study indicates several key areas related to the impact of farmer-led research that merit further investigation:

- Expanding and deepening insights into impacts of CSO-facilitated farmer-led research by conducting several independent impact studies on a selection of cases from this study, as well as on a few from the larger pool of cases that were discovered in this exercise.
- Delving deeper into issues regarding the spread of informal to semiformal farmer-led research processes, which could include the capacity to innovate, the uptake of experimentation by farmers not directly involved in the research, the role of paraprofessionals in farmer-led research, stimulating socio-institutional innovations, and gender and equity issues in farmer-led research processes.
- Studying the integration of farmer-led research approaches in governmental institutions at various levels to understand the reasons why carefully planned and implemented strategies to institutionalize such approaches into governmental services were not successful and what can be learned from partially successful efforts.

Deeper investigation of these three key areas will require research approaches that are tailored to the different and specific issues to be addressed in each of them. This could be a combination of well-structured and focused independent impact studies with other mixed forms of investigation to elicit local views on some of the questions raised. In view of the promising activities that seem to be continuing in rural communities under the radar of formal research and development, as well as the need for better understanding of the dynamics involved, scientists in international and national research organizations could gain insights and play an important role in analyzing and documenting such cases of endogenous and CSO-facilitated farmer-led research. The process of joint documentation and analysis makes all participants more aware of what is happening in the process and helps them identify ways in which farmer-led research could be enhanced.

In addition, action research into these questions could be conducted in the midst of ongoing development processes and involve all stakeholders — including the rural communities — in learning about the processes. This kind of research could be integrated into the CGIAR research program activities at their action-research sites, with a good participatory monitoring and evaluation system for reflection, mutual learning and making corrections during the course of action.

INTRODUCTION

Why this study?

Much of the food consumed in the world today is produced by millions of smallholder farmers — a term that includes fishers, livestock keepers and other users of natural resources — mainly in the Global South. The formal agricultural research and development sector is made up of a large group of international, regional and national agricultural research centers, academic institutions and extension agencies mandated to engage in research and development that supports and sustains the livelihoods of these smallholder farmers. Despite considerable public funding for this research over several decades, the formal sector is often not producing research outcomes that bring the intended benefits to their target groups.

Donors, policymakers and CSOs are exerting mounting pressure on the formal research sector to find ways to make their work more useful to smallholders. This is driving change within the sector, including the CGIAR system, and many agricultural research institutions are now seeking ways to tune into the needs and aspirations of smallholders and to engage with them more meaningfully. Some researchers within these institutions are exploring ways to make their research more relevant for and accessible to smallholder farmers and are looking for examples and good practices to learn from, as well as practitioners from the informal research and development sector[3] to partner with.

Examples of research that is more focused on smallholder farmers, where the research process is co-managed and driven by smallholders and is participatory by design, are largely in the informal sector, in some cases facilitated by CSOs. Information on the process and outcomes of these initiatives rarely appears in the formal literature, such as double-refereed scientific journals. Most of the documentation of these examples remains in program and project reports, other CSO documents and websites, and more practice-oriented — less academic — development literature, such as books, magazines and papers, which are often not known to formal researchers.

It is evident that there is still a significant divide between the worlds of formal and informal agricultural research and development, despite the fact that they seek common goals in serving smallholder communities. This divide needs to be bridged in order to support mutual learning and to foster partnerships between actors that would lead to more useful and sustainable outcomes for smallholders.

The AAS program and the international secretariat of PROLINNOVA,[4] a Global Partnership Programme of the Global Forum for Agricultural Research (GFAR), have been exploring ways of partnering to bridge this divide. PROLINNOVA is an NGO-led multistakeholder international network that has been engaged in promoting farmer innovation and farmer-led participatory research through multistakeholder partnerships for more than 10 years. The AAS program is a "system CGIAR research program" that is pursuing a more process-oriented approach that involves embedding research within development processes and, in so doing, strengthening capacities of stakeholders to innovate and adapt. Another CGIAR research program (CCAFS) recognized the similarity with its own work on social learning as a pathway to transformative change in agricultural research and development and is likewise partnering with PROLINNOVA in these efforts.

In view of these common interests, the PROLINNOVA international secretariat agreed with the AAS and CCAFS programs to carry out a desk study in order to compile evidence from the CSO sector on the impact of farmer-led research and innovation processes in smallholder agriculture in terms of food security, economic empowerment, improved gender relations, environmental sustainability and other issues arising.

The steps (a) to (m) in the concept note (Annex A) became the terms of reference for the desk study, which was carried out from November 2013 to April 2014. The report was revised and finalized in August 2014.

How the desk study was done

A major challenge was to find a methodology for assessing impact of farmer-led research approaches that would be sufficiently credible for formal research and development stakeholders. Because CSO-initiated research and development processes and impacts are generally not documented in scientific literature, a review of conventional databases and journal articles would not have brought many relevant cases to light. As noted by Hagen-Zanker et al. (2012) when reflecting on the use of systematic reviews in international development research, "relevant research is often located outside the formal peer-reviewed channels." In fact, there was no certainty of the type and quantity of documentation that could be found anywhere about the impact of informal agricultural research and development. Therefore, an exploratory approach was taken to discover cases of farmer-led research approaches, to gather whatever relevant documentation was available on each of these cases, to assess the quality of evidence in these documents, and then to select those cases with the strongest quality of documented evidence for the analytical study.

The desk-study team of five persons — all staff members of ETC Foundation — has altogether several decades of experience in facilitating, documenting and assessing participatory research and development initiatives. A small voluntary and highly experienced advisory group provided methodological support and quality oversight to the study; this group comprised David Gibbon (independent), John Mayne (independent), Patti Kristjanson (CCAFS) and Stephen Sherwood (EkoRural and Wageningen University).

The five persons making up the team share a theory of change that applies to two main levels:

i) **Farming communities**. If smallholder farming communities and other, external agricultural research and development actors recognize the value of local knowledge and creativity, they will be better able to appreciate local potential to tackle current and new challenges. This appreciation will stimulate local people's pride and confidence, and will encourage them to try out new possibilities. The farmers' own experimentation will also reveal issues of local priority and provide a good starting point for joint experimentation by farmers and other agricultural research and development actors to develop new and better ways of doing things. This experience of co-learning will strengthen the linkages and mutual understanding between the farmers and other actors and make them better able to continue to interact in adapting to change and in grasping new opportunities and ideas, from whatever source. Increasing farmers' access to other sources and types of knowledge and encouraging their involvement in multistakeholder co-learning processes will enhance the capacity of all the people involved to innovate and adapt.

ii) **Agricultural research and development institutions**. If approaches to agricultural research and development as described above are integrated into relevant institutions for research, extension and education, the innovation and adaptation processes in agricultural and rural development will be accelerated and expanded. Providing evidence of how such approaches work on the ground will strengthen the arguments of those trying to institutionalize these approaches. Referring specifically to this study, the team is exploring — in collaboration with people involved in two CGIAR research programs — the strengths and weaknesses of past farmer-led research approaches supported by CSOs in order to learn together about these approaches, and thus to strengthen the work of these CGIAR research programs as they strive toward the intermediate development outcomes "enhanced capacity to innovate" and "enhanced capacity to adapt." If CGIAR research programs such as the AAS and CCAFS programs can give international recognition to the importance of farmer-led research approaches, this would provide strong examples for regional and national research and development institutions and would help promote more widely farmer-led approaches that enhance local capacities to innovate and adapt.

Identification of potential cases of farmer-led research

The first step in the study was to identify potential cases of farmer-led research that had been or are supported by CSOs. Several methods were used to source potential cases, including a general call that was widely distributed, a Web search on selected keywords, a scan of selected literature, and direct contact with individuals who might be able to provide relevant information.

In early November 2013, the study team discussed the type of cases that would need to be identified and drafted the text for the call as found in Annex B. The text was translated into French and Spanish. The call was sent directly to the electronic mailing lists and organizations listed in Annex C and, in a few cases, to an individual within the organization with a request to circulate it widely.

A Web search was done using the search engines Google and Google Scholar. The following search terms were used: farmer-led research and development; participatory innovation development; participatory technology development; participatory research in agriculture; farmer-led joint experimentation; rural innovation; community-led development; community-driven development; and endogenous development.

Several publications from the last 10–15 years related to participatory, farmer-led research projects and programs were scanned to identify cases that could be used or followed up to obtain further impact information. Many of these publications had come out of workshops or "writeshops" that had brought together mainly CSO practitioners with several years of experience to share and document their experiences and learn together. The study team considered the publications listed in Annex C to be the most relevant for the purpose. It did not scan double-refereed journals, as it assumed that Google and Google Scholar search engines would pick up relevant cases from these journals.

For the potential cases that were identified from these publications, the team did a further targeted Web search to find documents related to impacts of these specific cases. Where possible, individuals who were or are involved in the work were contacted to find additional material, particularly related to impacts.

Although a large number of people affiliated with farmer-led research were reached through the general call, the study team also directly contacted several individuals who are or had been involved in participatory research and development initiatives, recognized the creative capacity of farmers, and engaged with them in research. Some of them were from PROLINNOVA´s network; others were identified through publications; still others came through indirect means, such as the Web search. A list of the individuals contacted is given in Annex D.

First screening of cases and preparation of long list

In December 2013, the study team took stock of the cases received through the different sources. Though the general call was circulated widely and must have reached a large group of people, it yielded only 26 cases, most of which did not meet the requirements set out in the call. In the Web search, as expected, a small number of cases appeared repeatedly, as they were listed on different websites and were captured by the different search terms. However, many of the cases were related to formal research outside of the CSO sphere — that is, work done by international or national research centers — and therefore did not come within the focus of this study. Most of the potential cases for this study were found in the publications listed in Annex C and through direct contact with individuals who were involved in work related to farmer-led research. As contact with one resource person and references in one document led to other persons and documents in a "snowball" fashion, links were made that enabled the study team to find appropriate cases.

These cases were screened using the following criteria:

- Research process is or was participatory by design and co-managed by smallholders.
- Case is not likely to be picked up in a review of cases in mainstream formal research.
- Could include bilateral development intervention implemented with local or international NGOs.
- Interventions by CSOs, including both NGOs and farmer organizations, or organizations with a mixture of CSO programs and advisory or consultancy work, such as the Intermediate Technology Development Group (ITDG), now known as Practical Action.
- Case involves not just a single farmer's own experimentation but some kind of structured interaction with others in action research, including community-based groups.
- Availability of some documented evidence of impact.
- Intervention happened several years ago or has been going on for at least a couple of years so that some impacts might be visible.

After screening over 100 possible cases (see Annex E), the study team compiled a long list of 41 potential case studies (Annex F). The cases varied greatly in terms of the strength of documented evidence of impact. Based on the impact studies, evaluation reports and other documents that had been found, the cases were given a rating of strong, medium or weak. Only a few had sufficient documented evidence of impact to be rated as strong. Most cases were rated medium to weak, as the search thus far had yielded few documents that could be used for the purpose of assessing the farmer-led research approach taken in the case.

Second screening of cases and preparation of short list

To be able to screen the 41 cases in the long list and to make a short list of 10–15 cases to be used for the desk study, the team prepared a second, stricter set of criteria and sent the list to the advisory group for comment. Based on the feedback, the study team revised the criteria to the following:

Referring to the topic:

- Farmer-led experimentation or research is central or prominent within the approach, as seen from the published material.
- Technological or other innovations or livelihood improvements, as well as the farmer-led research approach itself, have spread beyond the location or locations where the intervention began; data on spread are available.
- Case contributes to making the collection of cases diverse in terms of the CSO involvement — international NGO, national NGO, farmer organization, farmers' own initiative — and geographical location.

Referring to the quality of evidence:

- At least one solid piece of documentation on impacts available — that is, assessment done by external evaluators, clearly tracing link from original intervention to results, perhaps published — and there is a high probability of finding more information within a short time.
- Farmer-led research process has been or is going on for three or more years.
- Includes good description of the intervention and hence at least the de facto overall theory of change.
- For older cases — that is, from the 1980s — existence of interim impact assessments and evidence of continued effects and lessons that could be useful for the study; use no more than three such cases for the study.
- Contact possible with a "living insider" who can provide adequate insights and up-to-date information on the case.

The 41 cases in the long list were screened again according to these criteria. In a strict sense, none of the cases fulfilled all of the requirements set out in the criteria. Therefore, the study team used its discretion to select the cases that came closest to meeting the criteria and where there was high probability of finding additional information. Thirteen cases were shortlisted (Annex G), including two cases for which more information about impact still had to be sought to merit their inclusion.

Developing a format and writing up the cases

The next step in the study process was to draw out information on the selected cases from the material and to assemble this information in a way that would facilitate analysis of the approaches. The key information required for the study was about outcomes and impacts of the approaches. The team drafted a format for compiling the information on the cases, which included a general description of the case and four main areas for review: the main outcomes of the farmer-led research process; its impact on farmers' livelihoods; whether and how it enhanced the local capacity to innovate; and its impact on governmental and civil society institutions of agricultural research and development. This format was further revised with feedback from the advisory group. This revised case-study format (Annex H) was used to write up 11 of the shortlisted cases; sufficient documentation for the other two cases could not be obtained. It was agreed that the case write-ups would be about six pages long, including about two pages describing the approach and the remaining four pages providing information on impacts and lessons.

The tasks of writing up the cases and internal peer review of the write-ups were shared within the team. To start with, two cases were drafted using the format and sent to the advisory group members. Their feedback was generally positive on the overall assembly of the information and indicated a few areas that needed further attention. These were taken into consideration in writing up the rest of the cases. Throughout the writing process, regular contact was sought through email and Skype with various individuals who could provide more information to fill in some of the gaps that appeared. To the extent possible, drafts of the write-ups were shared with the relevant individuals who had been in contact with the study team during this study, and their feedback was incorporated into the final versions of the case studies.

It is noteworthy that none of the cases identified for the long or short list for this study included any explicit theory of change. When writing up the cases, the study-team member formulated a theory of change on the basis of the objectives and, if present, the logical framework in the project documents. It was also a matter of the team's own interpretation whether the original "theory of change" was adjusted over time in the light of project experience.

Analysis of the findings from the case studies
The information in the case studies — that is, the six-page summaries of several documents on each case — was analyzed in a progressive process of synthesizing, clustering, comparing, contrasting, further synthesizing, and then drawing out main characteristics and lessons. For the section on outcomes and impacts of the farmer-led research approaches, the relevant information from the 11 case studies was clustered according to the topics in the outline for describing the cases. Note was taken of similarities and differences in the outcomes and impacts and how these related to whether the CSO intervention in the case focused primarily on technology development, enhancing innovative capacities or upscaling the approach.

For the section on lessons learned, only those lessons that appeared to be more broadly applicable beyond the individual cases were clustered according to topics that emerged during the comparison. These topics involved lessons about the process of farmer-led research and how it was supported by CSOs; sharing the results and process of farmer-led research and scaling up or institutionalizing the approach; gender and other equity issues in farmer-led interventions; and the roles of different supporting actors, such as farmer organizations, NGOs, governmental research and advisory services, and donors. On the basis of a brainstorming exercise by the study team, some crosscutting lessons were drawn and an initial analysis made of the reasons for the relative success or failure of CSO-facilitated farmer-led research approaches. The team identified the actual and potential role of formal research and development actors in improving and expanding the farmer-led innovation processes and approach and — equally important — in not undermining endogenous processes. Two study-team members elaborated the draft report and sent it simultaneously to the other team members and to the advisory group for feedback, which was then incorporated into the final version of the report.

Structure of this report

This report captures the findings of this exploratory study to compile evidence on the impacts of farmer-led research supported by CSOs. The following section presents an overview and summaries of the 11 case studies, the longer versions of which can be found in Annex I. The next section focuses on the impacts of these farmer-led research approaches, drawn together from the cases. The impacts are categorized according to the four areas described in the case studies: findings from the farmer-led research; impact on farmers' livelihoods; impact on local capacity to innovate; and impact on governmental and civil society institutions of agricultural research and development. The fourth section captures the lessons learned, including some factors for success or failure of the approaches, while the fifth section presents an assessment of the strength of the evidence and of the analysis made of the evidence. The final section concludes the report with suggestions for the next steps in the study.

OVERVIEW AND SUMMARIES OF THE 11 CASES

Thirteen cases were initially included in the short list (Annex G), but because insufficient additional information on impact could be found for the cases on participatory technology development (PTD) in Nepal and participatory innovation development (PID) in Tanzania, these two were excluded. The 11 cases finally selected for the desk review are very diverse and can be broadly categorized as follows:

Geographical coverage. The interventions are taking place or have taken place in countries and regions in three continents. Six of the cases are from Africa (three from West Africa, two from East Africa and one from southern Africa), two are from Southeast Asia and three are from Central America.

Type of organization in facilitation role. Various types of persons or organizations facilitated the collaboration described in the cases: in three cases, an individual farmer or a farmer organization; in one case, a multistakeholder network coordinated by an NGO; in yet another, a national NGO. International NGOs played a facilitation role in six cases, one of which was a donor-funded bilateral project.

Period of intervention. The period of CSO intervention of the cases ranges from six to nearly 30 years. Six of the interventions are still continuing; in five cases, the intervention came to an end several years ago.

Main partners in implementation. The facilitating CSOs were or are partnering with a range of other actors in supporting the farmer-led research activities. In four cases, collaboration was or is mainly with governmental services; in five cases, it was or is mainly with other NGOs, farmer organizations and community-based organizations. In two cases, interaction with nonfarmer actors was not prominent.

Main focus of research. The farmer-led research in the cases focuses on several different topics. Three of them are on crops, two on seed improvement, two on soil and water conservation, one on forestry, and one on soil-improvement measures. In two cases, the experiments undertaken by farmers covered a multitude of topics related to various aspects of development, including health and education.

The 11 cases selected for the short list were roughly clustered according to the interpretation by the study team, starting with Cases 1–3, in which the process was initiated and carried out by farmers themselves with minimal external support. Next comes a group of cases (4–8) where the farmer-led research process was initiated through external intervention of a CSO. Finally, Cases 9–11 focus on institutionalization of a farmer-led research approach. The write-ups of the 11 cases are found in Annex I and are summarized here.

Case 1: Farmers developing and disseminating *zaï* in Burkina Faso

The *zaï* innovation is an improvement of an indigenous practice of making planting pits to restore degraded land and to allow its cultivation. Two farmer innovators in Burkina Faso and the farmer groups they set up are credited with the development and initial spread of this innovation, starting in the early 1980s. Later, various NGOs, bilateral projects and research programs facilitated the spread of *zaï* to thousands of farmers within and beyond the country. The use of *zaï* continues to spread to farmers across West Africa, spontaneously as well as through the intervention of different development agencies.

Case 2: *Campesino a Campesino* in Central America

The *Campesino a Campesino* program in Nicaragua, running from 1986 to 1989, was started by the *Unión Nacional de Agricultores y Ganaderos* (UNAG) or "National Farmers and Cattle Ranchers Union." A small group of volunteer Nicaraguan smallholder farmers who were trained by their Mexican counterparts formed a team of paraprofessional farmer-experimenters and farmer-promoters. Over the next few years, with support from various NGOs and donors and through farmer-to-farmer sharing, hundreds of farmers were introduced to small-scale experimentation, mainly on soil improvement. Many of these farmers began experimenting themselves and joined the ranks of farmer-promoters, transforming the program into a nationwide movement that is still active under UNAG.

Case 3: MASIPAG (Farmer-Scientist Partnership for Agricultural Development) to promote farmer-led sustainable agriculture in the Philippines

A group of farmers in the Philippines who wanted to breed their own rice varieties in order to break away from high-external-input agriculture joined up with a group of scientists to set up the *Magasaka at Siyentipiko para sa Pag-unlad ng Agrikulutura* (MASIPAG) or "Farmer-Scientist Partnership for Agricultural Development." What started as a small farmer-led rice-breeding program in 1985 has grown into a national farmer network and movement. Currently, MASIPAG has three offices and over 30,000 members spread across the country, working through farmer groups called "people's organizations."

Case 4: Farmer-experimenters in Honduras

The US-based NGO World Neighbors worked with smallholders in several countries in Central America to improve their farming through small-scale experimentation, mainly related to crops. The two main elements of the approach promoted by World Neighbors were experimentation by farmers and farmer-to-farmer learning. This "farmer-experimenter" approach was implemented in the period 1972–1993 through a number of integrated development projects with multiple partners and supported by various donors. The case in this study focuses mainly on the work done in Honduras and the impacts thereof.

Case 5: Farmer participatory research in Tanzania

The UK-based NGO FARM–Africa[5] promoted farmer participatory research (FPR) as a central component of its agricultural development work in eastern Africa. It sought the active participation of farmers and other stakeholders in agricultural research. This case looks at the impacts of this approach, which was one of five components of the Babati Rural Development Project implemented in the Babati District of Tanzania in the period 2000–2007, in collaboration mainly with village extension officers of the district council. Farmer-led experimentation, focused on improved crop varieties, was undertaken through farmer research groups.

Case 6: Smallholder action research in Burkina Faso

Action research by small-scale family farmers is at the heart of the Diobass approach. It involves working with action-research groups to investigate issues in agriculture and natural resource management that include, among others, crop husbandry, soil fertility management, pest and disease management, animal health and nutrition, soil and water management, and marketing. A Belgian NGO introduced the Diobass approach into Burkina Faso in 1990. Since 2009, a national NGO has continued the work up to the present day, partnering with community-based and farmer organizations and, to a limited extent, government extension workers. Farmers are engaged in research on hundreds of different innovations.

Case 7: Participatory innovation development in Mali

The Promoting Farmer Experimentation and Innovation in the Sahel project (PROFEIS) started in 2006 in West Africa as an action-research program to promote farmer innovation and PID. It seeks to embed agricultural research and extension activities within rural communities in a way that enables a constructive exchange of experiences and knowledge between farmers, extension agents and formal researchers. A Malian NGO, *Association pour le Développement des Activités de Production et de Formation* or "Association for Development of Production and Training Activities," known as ADAF-Gallè, coordinates the work of PROFEIS-Mali, undertaken in partnership with other NGOs and governmental research and development services. Field activities are in the two districts of Ségou and Mopti with oversight by the PROFEIS-Mali member Association of Professional Smallholder Organisations (known by its French acronym AOPP). PID activities are conducted on various topics, building on local innovations identified in the communities.

Case 8: Local agricultural research committees (CIALs) in Honduras

The *comité de investigación agrícola local* (CIAL) or "local agricultural research committee" approach was initiated in Honduras in 1993 and is being promoted by the Honduran NGO *Fundación para la Investigación Participativa con Agricultores de Honduras* (FIPAH) or "Foundation for Participatory Research with Honduran Farmers." Farmers are supported in doing research to solve local agricultural problems through their involvement in CIALs. The main focus of the research has been on farmer-led breeding of locally adapted varieties of maize and beans, which are the staple foods in the area. Currently, FIPAH is working in Yoro, Francisco Morazan and Intibuca regions of Honduras, where up to 100 CIALs are functioning.

Case 9: Kuturaya participatory extension approach in Zimbabwe

The participatory extension approach was introduced to Zimbabwe in 1991–1997 through the Chivi Food Security Project, implemented in Chivi District, Masvingo Province, by ITDG, the UK-based NGO now called Practical Action. The Department of Agricultural Technical and Extension Services (Agritex) and the German-funded Conservation Tillage Research Project (ConTill) were the main partners in implementing the work. Farmer experimentation, called "Kuturaya," was undertaken by farmer groups as a key element of the approach, which gave attention to both technological and socio-organizational aspects of innovation. Soil and water conservation was one of the main research topics of the farmer groups.

Case 10: Participatory technology development as an approach to extension in Vietnam

The Swiss-funded Social Forestry Support Programme, which ran from 1994 to 2002, introduced PTD to staff of seven institutes of forestry education and training in three provinces in Vietnam. This was followed by the Extension and Training Support Project for Forestry and Agriculture in the Uplands (2003–2007), which aimed to mainstream PTD and other participatory approaches within the universities and extension organizations working in forestry and agriculture in the three provinces. The Swiss NGO Helvetas implemented the project in collaboration with governmental agencies of research, extension and education.

Case 11: Institutionalizing farmer participatory research in southern Ethiopia

FARM–Africa implemented an FPR project (similar to the one described in Case 5) in Ethiopia in the period 1991–1998. This was followed by the Institutionalisation of Farmer Participatory Research in the Southern Nations, Nationalities and Peoples Regional State project in 1999–2003 in 14 districts. FARM–Africa partnered in this project with the Bureau of Agriculture, the Awassa and Areka Agricultural Centres, Awassa College of Agriculture, and the Bureau of Planning and Economic Development. The project aimed to integrate FPR into governmental institutions of research, extension and education. The participatory on-farm trials (POFTs) undertaken by farmers supported by the trained staff of these institutions were mainly on selection of improved crop varieties.

The outcomes and impacts of the farmer-led research are described here in four areas: i) farmer-led research findings and their dissemination; ii) impact on farmers' livelihoods; iii) impact on local capacity to innovate; and iv) impact on governmental and civil society institutions of agricultural research and development. References are made only to the case-study numbers. References to the sources of the information can be found at the end of the relevant case description in Annex I.

Farmer-led research findings and their dissemination

The farmer-led research in the 11 cases summarized above led to various findings, innovations and adaptations, some of which could be applied more widely and some of which appeared to be of interest only for a specific community or even a specific farm. Farmers in different areas were experimenting with hundreds of different innovations and exploring innumerable different questions that were relevant for their particular locality. This section describes some of the main types of innovations and results, and describes how and to what extent these results were disseminated.

Types of innovations and experiments

Land improvement. Most of the farmer-led research involved techniques for land reclamation or improvement and soil and water conservation. The farmer-developed *zaï* cultivation technique in Burkina Faso (Case 1) proved effective in bringing barren land back into cultivation and improving the quality of cultivated land. The *zaï* pits harvested runoff water, allowed greater water infiltration, and increased soil fertility when manure or compost was added to the pits. This technique improved the soil in terms of organic matter, nitrogen content and pH value. In semiarid areas of the West African Sahel, to which this technique quickly spread, the use of *zaï* with organic matter led to cereal yields at least two (Mali) or three (Niger) times higher than in fields without *zaï*, and addition of inorganic fertilizer in the *zaï* pits led to even higher yields.

The farmer-led research activities in Central America (Cases 2, 4 and 8) initially involved experiments with green manure and cover crops. The farmers in the *Campesino a Campesino* movement (Case 2) found that cover crops helped suppress weed growth, reduce labor inputs or costs of producing crops, increase productivity, and reduce production risks. In Honduras (Case 4), the farmers who experimented with green manures averaged maize yields of more than 2,000 kilograms per hectare, compared to about 800 kilograms per hectare without green manures; in some areas, the yields increased to over 4,000 kilograms per hectare. The farmers adapted green-manure seeding rates, crop associations and management regimes to their own specific needs. Their continued and expanding experimentation led to a reduction in land degradation and almost total elimination of herbicide use.

In Case 8 (CIALs in Honduras), although the focus was on participatory plant breeding, the farmer groups also — through their own experimentation — developed and applied several land-improvement practices, such as use of organic and green manures, zero and minimum tillage, and other erosion-control measures.

During four years of farmer-led research in Zimbabwe (Case 9), farmers and extensionists co-developed over 20 new land-husbandry technologies that matched the heterogeneity of smallholder agriculture in the area. By using soil and water conservation practices such as tied ridging and infiltration pits, farmers could save more water with less work. Limited availability of draft animals constrained uptake of animal traction after farmers experimented with this, including ridging with a farmer-adapted version of an introduced moldboard plow.

Plant breeding and varietal selection. Another common focus of farmer-led research is on crop species and varieties. This includes plant breeding, varietal selection and biodiversity management. In the Philippines (Case 3), the highly decentralized MASIPAG network has collected and conserved over 1,000 traditional rice varieties and, through farmer-led breeding, has developed over 1,000 additional site-adapted varieties and 185 farmer-selected lines. The yields of farmer-bred varieties are on par with high-yielding varieties used in conventional farming; moreover, the yields of MASIPAG organic farmers (who do not use chemical inputs) are increasing, whereas the yields of conventional farmers are declining. Over three-quarters of MASIPAG organic farmers select seeds in their own fields, compared to one-quarter of conventional farmers, and thus can maintain and improve yield levels. Most MASIPAG farmers test new seed for performance under local conditions, unlike conventional farmers. MASIPAG farmers also have higher varietal diversity: on average, 4.8 rice varieties compared to 1.6 for conventional farmers.

The CIALs in Honduras (Case 8) started by testing cultivars of maize and beans introduced by the supporting NGO but then switched to improving their own landraces, which were more suitable for their diverse microclimates. Through participatory plant breeding, CIALs developed and released seven improved high-yielding bean varieties and six new maize varieties. Because the CIALs valued the landraces more highly, they developed a system to maintain local agrobiodiversity and now manage 13 seedbanks of landraces.

In Tanzania (Case 5), the composite maize varieties tested by the farmers yielded more than twice as much as local varieties, using the same cultivation practices of manuring and plant spacing, which more than compensated for the cost of the seed. Introduced bean varieties tested by farmers brought 35–79 percent higher yields than local varieties. The combination of introduced seed, soil and water conservation, and soil-improvement techniques such as terracing and applying farmyard manure led to 47 percent higher yields than in traditional practice.

Similarly, many of the technologies tested by farmers in the POFTs in Ethiopia (Case 11) concerned selection of improved varieties such as potatoes and wheat; here, as in Tanzania, only introduced seed was tested by the farmers supported by the NGO — FARM–Africa in both cases.

Crop protection. Much of the experimentation done by farmers in the Diobass network in Burkina Faso (Case 6) involved crop-protection techniques using locally available resources that were usually plant-based. Among other things, they developed a powder to control striga in their fields and thus managed to improve grain harvest. Farmer-experimenters in Mali (Case 7) also tackled the striga problem, as well as developing biological pesticides for horticulture, which were reportedly effective.

The CSO-facilitated work with farmer-experimenters in Central America (Case 4) started by encouraging farmers to try out new soil-improvement techniques, but after the project ended, the farmers seemed to prefer to experiment with new ideas in pest and disease control using low levels of external inputs. Their experimentation led to a marked reduction in use of chemical fertilizers.

Storage and processing of produce. Most of the documented farmer-led research was related to agricultural production rather than to storage, processing or marketing of agricultural produce. However, a few examples of such research come from the farmers in the Diobass network in Burkina Faso (Case 6), who developed a better way to conserve onions; the farmers in Mali (Case 7), who developed improved methods for conserving and storing fish; and the farmers in southern Ethiopia (Case 11), who found better ways to store potatoes.

Livestock husbandry. For livestock, experimenting farmers in Burkina Faso (Case 6) developed herbal treatments and mineral blocks, leading to lower expenditures for veterinary medicines and higher survival rates of the animals. In Vietnam (Case 10), farmers developed the idea of using giant tea for fodder. Farmers in southern Ethiopia (Case 11) tested various cultivated forages so as to improve the draft power of oxen and produce more meat and milk for the households.

Because of a deliberate focus taken by some supporting CSOs on innovation by resource-poor farmers and by women, the experimentation related to livestock husbandry tended to be related to poultry and small ruminants, the species of livestock that poorer households and women possess or at least care for. In Mali (Case 7), farmer-experimenters developed an egg incubator made of local materials that cost less than one-fifth of the price of an industrially produced incubator.

Natural resource management. Innovations that came out of the PTD process in Vietnam (Case 10) were related to natural resource management, as this started as a project to develop innovations in social forestry and to integrate the PTD approach into institutions of higher education in forestry. The communities, working with university staff and extensionists, developed new ways of allocating and managing land and forests, community-based practices to control soil erosion, use of nontimber forest products, and ways of integrating woody species into cropland, such as building rattan protection fences and growing Liong bamboo in gardens. In both Burkina Faso (Case 1) and Honduras (Case 4), farmers' experimentation with soil and water conservation techniques incorporating perennial woody species led to a higher number of trees on cropland.

Socio-institutional innovation. Documented examples of farmer experimentation with socio-institutional innovations were few. Such innovations were developed through informal action research: exploring a new way of doing things, discussing how it was functioning and then making adjustments if necessary. One example is the local innovation in one village in Mali of charging taxes on transport carts to generate funds to cover operational costs of the local school (Case 7).

Documentation and dissemination of the farmer-led research process and results

Records on the farmers' trials. In some cases — Case 7, supported by PROFEIS in Mali; Case 10, supported by Helvetas in Vietnam; and Cases 5 and 11, supported by FARM–Africa in Tanzania and Ethiopia — the NGOs taught the farmers how to keep records on their experiments. In Mali, evaluators noted that the data were not systematically analyzed and that neither the farmers nor the supporting NGO captured information on the effects and impacts of the specific innovations. In Vietnam, the fact that the farmers were recording data from their experiments meant that they could easily disseminate the results orally to other farmers. FARM–Africa analyzed data coming out of the farmers' trials and shared the results and lessons learned with an international readership through papers and articles, but it is not clear to what extent this information was fed back to the farmer-researchers and farmer research groups concerned.

Documentation on the process and approach. Especially when NGOs were seeking to integrate a farmer-led research approach into governmental institutions, the process of and lessons from using the approach were documented in detail in many different forms and widely spread at national and also international levels. For example, in Zimbabwe (Case 9), ITDG and Agritex produced a participatory extension guide, training materials and a video film. They also arranged exposure visits by government staff to the field to learn about the process and findings of the farmer-led research. The process documentation included little information about the results of the farmers' experiments or analysis of these data, which were presented in separate documents.[6]

Modes of sharing farmers' research findings. By far the most common way of sharing the findings of farmers' experiments appeared to be orally from farmer to farmer through informal networks. In Burkina Faso (Case 1), farmers who were convinced about the effectiveness of their innovations invested their own time in sharing their findings widely with other farmers by organizing *zaï* fairs without external support. In this way, information about *zaï* spread far beyond the villages of the initial innovators. The rapid and largely spontaneous spread of the *zaï* technique to restore degraded land and improve cultivated land indicates that dryland farmers in the Sahel regarded this technique as being effective for these purposes. Many of the innovations developed through farmer-led research in Mali (Case 7) were reportedly spreading through informal farmer networks without any systematic support by the project or the national extension system. It was not clear from the documentation

whether this was due primarily to the strength of the informal networks, the nature of the innovations or other factors.

The next most common mode of dissemination was through deliberately created opportunities for farmer-experimenters and other farmers to meet and exchange directly with each other. In Nicaragua (Case 2), various NGOs supported the national farmer organization in arranging visits by farmers to the farmer-experimenters to learn from them, organized meetings for farmer-to-farmer dissemination of findings, and held a national symposium where farmer-experimenters shared their results. The MASIPAG farmers in the Philippines (Case 3) share information directly with other farmers through organized events such as visits to trial farms and exchange days. In Burkina Faso, Diobass helped local farmer representatives organize village-level "knowledge fairs" where the farmer research groups could present their findings to other farmers in their own and neighboring villages (Case 6).

Some CSOs used mass media to help farmers share their findings. For example, in Central America (Case 2), project staff interviewed farmer-experimenters about their experiences and suggestions for managing green manures and then disseminated this information through weekly radio broadcasts. In Burkina Faso, the farmer organization working with Diobass also used radio broadcasts and leaflets prepared by farmers as tools for sharing with other farmers (Case 6).

Extent of spread of farmers' research findings. Generally, the farmer-experimenters and other smallholder farmers in the community appeared to find the technologies coming out of the farmer-led research process to be relevant and useful. The types of farmer-developed innovation that were most popular were related to crop varieties and land improvement. Demand for the seed developed through participatory plant breeding by the CIALs in Honduras (Case 8) exceeded the supply, and farmers were willing to pay a premium for this seed. A survey in 2010 found that 60 percent of farmers not in the CIALs were using seed bred by the CIALs. In Tanzania, by Year 4 of the project (Case 5), about 60 percent of farm families in the farmer research group villages applied most of the innovations that the farmer research groups had found to work best;[7] almost 4,000 farmers changed some farming practices as a result of the participatory research process, mainly by expanding the application of new agronomic practices such as terracing, manuring and using introduced maize seed. In Zimbabwe, where ITDG used the Kuturaya approach to co-develop locally appropriate soil and water conservation technologies (Case 9), about 80 percent of the 1,300 households in Ward 21 were practicing at least one of the technologies by the end of the project. Five of nine soil and water conservation practices on cropland and all of seven soil and water conservation practices in gardens had an estimated spread to 30–60 percent of households in the ward. In northern Burkina Faso (Case 1), thousands of farmers were reportedly using *zaï* on tens of thousands of hectares. Three years after 13 farmers from Niger visited Burkina Faso in 1989, they were buying severely degraded land in Niger to rehabilitate it using *zaï*, and by 1993, over 10,000 households in Niger were applying this technique. Likewise, hundreds of thousands of smallholders in Central America are reported to have reclaimed eroded land, raised productivity and improved their livelihoods through farmers' experimentation with cover crops (Case 2).

Farmer innovations that required no or few external inputs and brought obvious benefits within a couple of years — such as land improvement using local resources, including labor, and locally produced seed of improved varieties developed by farmers — spread quickly in an informal way. A 2010 survey of 450 CIAL members in Honduras (Case 8) found that half of them used organic manure and incorporated crop residues to improve the soil and a fifth used green manures. In Case 4, about 20 years after World Neighbors had started to encourage farmers in Central America to experiment with green-manure species, these were being used by over 200,000 farmers. This spread could not be attributed only to the CSO-facilitated farmer-led research and development work, as several government projects and international research centers were also working with farmers in testing green manures, but the farmer-led research doubtless contributed to the wide and rapid spread of green manures. This issue of attribution versus contribution was specifically mentioned in this case; it would doubtless apply in other cases reviewed but was not mentioned in the documentation.

Limits to dissemination. There appeared to be some limits to spontaneous dissemination, especially where the farmer-experimenters themselves or the supporting NGOs made no efforts to support this. In Honduras (Case 4), it was found that the farmer-tested technologies spread spontaneously among neighbors within the farmer-experimenters' villages but not to other villages. Likewise, in Tanzania (Case 5), the findings from the farmers' trials were shared within the farmer research groups and with their neighbors, but little was done to enhance the spread of the findings more widely beyond these villages.

Where NGOs tried to upscale farmer-led research approaches rather than the local solutions coming out of the process, they deliberately created spaces for stakeholders to reflect on the methods and process of the approach and to learn from each other, such as through the FPR fora set up by FARM–Africa in Ethiopia (Case 11). In this case and in Vietnam (Case 10), the project's monitoring and evaluation focused on the extent of institutionalization; little was reported on the results of the farmers' research or the dissemination of these results, possibly because the solutions were seen as local and the process was seen as scalable. At the other extreme, where NGOs promoted farmers' research more or less independently from the conventional formal research and development system, as was the case with Diobass in Burkina Faso (Case 6), there appeared to be little internal reflection on the farmer-led process, its impacts, its possible negative effects, and how the process could be improved. Reflection on the manner in which the CSOs were trying to support farmer-led research was also largely lacking.

Impact on farmers' livelihoods

Greater food and nutrition security. The primary focus of the work of the farmer-experimenters appeared to be on improving food security, and a positive impact in this respect was reported in almost all cases. In dryland farming in the Sahel (Case 1), the *zaï* innovation allowed accumulation of some surplus grain in good years to create a buffer for years of poor rainfall. By applying an innovation that used primarily low-cost and locally available resources — such as manure instead of chemical fertilizers — the farmers could reduce the risk in areas with high variability in rainfall between years.

During the 2007–2008 external impact assessment in the Philippines (Case 3), 88 percent of MASIPAG organic farmers reported that their food security was much better or better than in the year 2000, with 2 percent worse off, compared to 39 percent and 18 percent, respectively, of the conventional farmers. Because of their crop diversity, the households of MASIPAG organic farmers consumed a more nutritious and balanced diet, including more vegetables, fruit, protein-rich staples and meat, than households of conventional farmers. Most MASIPAG organic farmers — 85 percent — rated their health much better or better than in the year 2000, compared to 32 percent of conventional farmers.

After intervention ceased in Central America (Case 4), the ongoing farmer-led process of experimentation and innovation, rather than any one technology developed during the project period, led to a continued rise in average yields over the years and improved human diets that included more vegetables, native herbs, milk and cheese. Increased agricultural biodiversity was also reported: In the 40 years since the first farmer-experimenters were trained in Guatemala, the number of different crops sold on the municipal market increased from seven to over 90 species; in the 30 years since the approach was started in Honduras, the increase was from two to about 25 different vegetable species. In Zimbabwe, ITDG's Kuturaya work (Case 9) also reportedly led to enhanced agricultural biodiversity, thus contributing to nutrition security and greater resilience despite climatic fluctuations.

Also in Honduras (Case 8), the key benefit of the CIALs in the eyes of community members was that the improved yields of maize and beans achieved by committee members at least halved or completely eliminated the period of food insecurity before the new harvest. This was due not only to farmers' research, including plant breeding, but also to their improved capacity to calculate annual grain consumption and storage and to avoid buying grain at periods of higher prices.

The PTD approach in Vietnam (Case 10), as part of a wider approach to improve agricultural extension and training, led to increased yields

of all major crops: rice, maize and cassava. Also, the higher incomes (see below) contributed to improved food and nutrition security.

In Ethiopia (Case 11), increased yields as a result of farmer-led research were also reported. Some technologies tested by farmers helped fill the food deficit experienced by many households, such as the new potato and wheat varieties that doubled crop yield and food availability at the household level. Using better ways of storing potatoes, farmers could plant and harvest earlier, making use of early rains and shortening the food-deficit period.

Greater resilience to risk. In Central America (Case 2), a study carried out after Hurricane Mitch in 1998 revealed that the farms of farmer-experimenters had higher agroecological resistance to the hurricane in terms of having more topsoil, greater soil moisture, and less gully and rill erosion than the conventionally farmed plots. Because the farms of the local experimenters had higher crop diversity, they also suffered lower economic losses after the hurricane. In the Philippines (Case 3), the MASIPAG farmers reported that the improved varieties and agronomic practices that they had developed had led to greater tolerance of their crops to pests and diseases.

Higher household income. The impact of farmer-led research was often reported to be higher household income. In the Philippines (Case 3), the net agricultural income of MASIPAG farmers was 17 percent higher than that of conventional farmers, and the net agricultural income plus value of farm products consumed at home was 27 percent higher. Nearly three-quarters of the MASIPAG farmers reported an increase in income between 2000 and 2007, and only 6 percent reported a decrease, compared to 31 percent and 37 percent, respectively, among conventional farmers. In Central America (Case 4), impacts of the soil-improvement techniques included higher wage levels, incomes and land values. In Tanzania (Case 5), the farmers in the research groups reported that, because of considerable increases in income, they were better able to meet school costs, improve their housing, and buy dairy goats and cows, radios, mobile phones, and bicycles. In Burkina Faso (Case 6), the farmers' experimentation related to crops, animals, trees and crop storage led to higher incomes from selling farm products and — still more important for the farmers — income during the normally "hungry" time of year before cereal harvest, thus improving food security. In Mali (Case 7), despite few quantitative data, the external evaluators stated that the PID work had led to increased yields and household incomes — the latter by about 10 percent — not only for the farmer-researchers but also for others in the same and nearby communities. Increased income or reduced expenditure resulted from, for example, selling fruits and fruit trees after practicing a locally developed grafting technique; using a plant-based treatment to replace chemical products against lice; and using a low-cost egg incubator. Over 140 men and women had built their own incubators and invested income from guinea fowl into larger livestock and schooling. Farmers involved in Kuturaya in Zimbabwe (Case 9) reported higher incomes from selling vegetables and groundnuts and reduced production costs because of new soil-fertility and pest-management practices. More trucks of buyers came into the area, which helped solve a growing problem of marketing the produce. Finally, PTD in Vietnam (Case 10) led to higher incomes from crop sales and diversification of income sources from annual and perennial crops, which also improved resilience to risk.

Accumulation of savings and economic assets. The higher incomes from technologies co-developed by farmers allowed them to accumulate savings and invest in assets. As the improved crop production made possible through the use of *zaï* provided more crop residues that could be fed to animals, the farmers invested in more ruminant livestock (Case 1). In Central America (Case 4), the soil-improvement techniques led to increased local savings and less dependence on formal credit, as well as higher investment in education, land improvement and livestock. In Honduras (Case 8), the higher income from maize and beans likewise allowed CIAL members to increase their savings and invest in livestock. Over 50 percent of the members had savings, compared to 10 percent among nonmembers. Farmers involved in Kuturaya in Zimbabwe (Case 9) were able to use their increased income to invest in farm infrastructure, such as fencing, and to set up

a rotating savings and credit fund. In Ethiopia (Case 11), the increased income from the new technologies tested and selected by farmers allowed them to invest in productive assets such as oxen, and the cultivated forages improved the draft power of oxen, leading to still higher yields.

Higher labor productivity. In the documentation, the focus was primarily on impact in terms of yields and income; relatively little attention was given to issues of labor productivity. However, it was mentioned that in Central America (Case 4), the soil-improvement techniques tried out and locally adapted by farmers allowed them to use the same plot of land for up to 25 years instead of shifting every two to four years, so less labor was needed to clear plots for cultivation. In Tanzania (Case 5), the return to labor was 1.6–2.7 times higher for farmer-experimenters growing hybrid maize seed than for farmers growing local varieties. In some of the Sahelian areas where the *zaï* technique was applied (Case 1), water tables became higher; this reduced women's work in drawing water from wells.

Community-level and environmental impacts. In the documentation, the reported impacts tended to focus on the household rather than the community level. However, it was reported from Central America (Case 4) that the local development of land-improvement techniques led to a reduction in temporary emigration for wage labor, and some people who had emigrated to the cities returned to the villages. Here, as in Cases 2 and 8, there was increased contribution to community development through local paraprofessionals. Another impact of the farmer-led research activities was reported to be stronger cohesion and joint action within village groups and communities. In Mali (Case 7), the farmer-led research work, which included action research on taxing carts to cover school operational costs, contributed to a higher rate of school attendance and better human health status in the villages. In Vietnam (Case 10), the PTD activities in using natural forest helped build up durable arrangements for groups of households in a commune to access these natural resources.

The community-level impacts were also related to the environment. Most of the farmer-led research involved more intensive use of local resources and reduced use of chemical inputs and thus had positive environmental impacts. In the Philippines (Case 3), for example, the MASIPAG farmers' practices led to higher on-farm diversity of crops and livestock; more environmentally friendly forms of farming, including much lower use of chemical fertilizers, pesticides and herbicides; and less erosion than reported by conventional farmers.

Gender-related impacts. Much of the land-based experimentation by farmers tended to bring more benefits to medium and better-off farmers than to poorer women-headed households. For example, the *zaï* technique (Case 1) has been more readily applied by larger or richer male-headed households. In one case — PTD in Vietnam (Case 10) — the documentation does not mention gender issues, nor does it differentiate between benefits accruing to richer versus poorer farmers. In some cases, the CSO intervention had not initially included reflection on gender and other equity issues related to the farmer-led research processes, outcomes and impacts, but this gradually changed over time, perhaps because of donor influence. For example, in the early *Campesino a Campesino* activities in Central America (Case 2), women's involvement — rarely mentioned in the documents — was confined to gardening. However, during the process of building up and spreading the approach, more focused efforts — not specified in the documents reviewed — were reportedly made to enable equal participation by women and men.

In countries like the Philippines (Case 3), where women have long been active in the public sphere, women were active at all levels in MASIPAG as an organization, including the national and regional boards, and most MASIPAG staff members are female. Several women are among the farmer organization leaders and plant breeders, but men are in the majority. At farm household level, men continue to dominate in decision-making, but some movement toward joint decision-making was noted in the MASIPAG groups.

In Tanzania (Case 5), nearly half of the members of farmer research groups were women. However, a smaller proportion of female than male farmer-researchers who were involved in these groups were reported to have adopted the introduced crop varieties and practices. The available documents do not reveal reasons for this.

In Burkina Faso (Case 6), about 33 percent of the farmers doing the research and 43 percent of the farmers involved in related training activities were women. No mention is made of any particular measures taken to increase women's participation, but this may have included giving attention to off-farm income generation, as the greatest positive impact recorded was the women's increased confidence to develop new ideas and engage in income-generating activities. Within 15 years, the proportion of women generating their own cash income rose from 10 to 90 percent; the women concerned attributed this to the Diobass approach. They said they depended less on men for cash and used their own money to pay school fees.

In Case 8 — the CIALs in Honduras — the supporting NGO encouraged women to join the research groups to solve local agricultural problems, and did not apply selection criteria such as literacy, land ownership or prior project experience that would exclude many women. Women in the CIALs became more skilled in farming and able to carry out all farming activities independently — from sowing to harvesting — instead of just helping men in weeding. Husbands of these committee members respected the new competence of their wives; thus, cultural norms changed.

In Zimbabwe (Case 9), the supporting NGO deliberately involved women in participatory research and community leadership through Training for Transformation courses and worked with women's gardening groups. Both male and female community members were given gender training and took part in studies and a ward-level workshop on gender. Women's increased incomes through vegetable sales led to changes of power within the family, personal growth and reinforcement of women's leadership capacities. However, the increased levels of production, for example, of vegetables, put high demands on women's labor, and men began to take over groundnut production, which was previously a woman's crop. It is not clear whether or how these gender-related changes were addressed within the communities.

The approach taken in Ethiopia (Case 11) was to encourage experimentation in realms in which women were likely to be interested, such as keeping small livestock, processing the staple crop enset and cooking food. As a result of their involvement in on-farm and in-house trials, farmwomen opted for labor-saving technologies such as fuel-efficient stoves. It was observed that women involved in this research became better able to express themselves in public meetings.

Other equity-related impacts. Where the farmers tried out mainly introduced technologies that required purchased inputs or farm assets such as livestock for draft and manure, the results of the trials were often not relevant for the poorest households. For example, in Tanzania (Case 5), only about 5 percent of the poorest farmers in the project area applied any of the practices coming out of the FPR process, because these households lacked several things: i) cash to buy inputs such as seed, ii) cattle to access manure, and iii) labor for soil conservation work. Thus, the technologies that the NGO introduced for testing by farmers required assets that the poorest farmers did not have.

Where the farmers' experimentation was only on endogenous innovations using locally available resources, the results were more likely to be relevant for poorer farmers, as was the case in the Diobass work in Burkina Faso (Case 6). However, the evaluators of this work also pointed out that the exclusive focus on endogenous innovation development sometimes prevented the farmers from finding solutions to problems by linking to external sources of knowledge. The PID experiments in Mali (Case 7) likewise built on endogenous innovation and led to the development of low-cost improvements in farming that were readily accessible to poor farm families with limited capacity to buy external inputs. Focusing on such innovations also attracted the interest and improved the situation of women farmers.

Even where primarily locally available inputs were being used, if the CSO worked with farmers who had access to sufficient land to be able to carry out land-based experiments, this meant that the resulting innovations were more suitable for medium to better-off farmers in the villages. For example, in Vietnam (Case 10), the farmers' experiments in agroforestry attracted many other farmers from surrounding communes who started up similar experiments on their own, such as diversifying their coffee plantations with fruit trees, but these innovations with perennial plants required

secure longer-term access to land, which the poorer families did not have. Similarly, the *zaï* technique (Case 1) could be more readily applied by richer households that had access to family or hired labor; moreover, they also had the means to acquire still more degraded land that they could make arable by using the *zaï* technique.

In southern Ethiopia (Case 11), the supporting NGO conducted monitoring and evaluation that looked specifically at equity issues. It found that, as a result of the POFTs, the poorer households gained mostly in terms of food availability, whereas households in the medium and rich wealth categories were also able to accumulate assets. Poorer farmers could take up only one trial at a time, while richer farmers could carry out several trials simultaneously with different technologies. The impact assessment of the MASIPAG work in the Philippines (Case 3) examined equity issues and found that the work focus on farmer-bred seed and organic production techniques also benefited the poor. In the poorest quartile of respondents in the impact assessment, MASIPAG farmers' net agricultural income was 1.5 times that of conventional farmers. In the farmer-led research activities in Honduras (Case 4), the impact assessment revealed that the poorer farmers took up the soil-recuperation technologies more quickly and benefited more than did the richer farmers because the technologies brought greatest improvements on poorer soils, required no capital, involved traditional crops and were difficult to mechanize.

General remarks. The innovations developed through farmer-led experimentation were often specific to certain ecological areas and could not be widely scaled up. What could be scaled up was the approach of farmer experimentation to try out new ideas and to adapt introduced ideas to the local setting. The latter was the focus of the work of World Neighbors and the *Campesino a Campesino* movement in Central America (Cases 2 and 4), the Kuturaya approach in Zimbabwe (Case 9), the PTD approach in Vietnam (Case 10), and the FPR approach in Ethiopia (Case 11). However, some external evaluators did not understand this difference and judged the success of the intervention primarily or only according to the extent that specific technologies coming out of the experimentation had spread. This perspective ignores the importance of scaling up experimentation and innovation as a continuing process and also overlooks the fact that a particular technology may be useful at a given time but may no longer be needed later. For example, if the *zaï* technique (Case 1) has been used to reclaim degraded land, it is no longer as important for farmers after the land has been improved and other cultivation techniques can be applied.

Some of the innovations developed by experimenting farmers were complex, involving more than one change in components of the farming system — such as the innovations related to soil and water conservation — and the innovations were numerous and diverse. For example, in the Diobass project in Burkina Faso (Case 6), the evaluators found that the farmers were testing about 300 innovations. Having no systems to deal with such high numbers and diversity of innovations, the monitoring and evaluation staff and the formal scientists seeking to systematically assess the effectiveness of the locally developed innovations faced seemingly insurmountable challenges.

Even where it might have been possible, the farmers and supporting NGOs seldom systematically assessed the results of the innovations developed or tested by the farmers and also did not assess possible risks involved. FARM–Africa (Cases 5 and 11) was exceptional in the attention it gave to collecting and analyzing the results of the farmer-led experiments and investigations. In most other cases, the supporting NGOs did not collect relevant baseline data and did not interact with other research and development actors who might have been able to do so. The monitoring and evaluation process, participatory or otherwise, was generally weak. The information available on impact of farmer-led research on rural livelihoods was largely qualitative and not triangulated, and there was little systematic collection and analysis of data on, for example, changes in level of food security or income generation.

One impact assessment report (Boi et al. 2007) in Vietnam (Case 10) points out that not enough attention was given to monitoring, evaluating and documenting the outcomes and impacts of farmer-led research activities in terms of natural resource management and sustainable livelihoods of the local people. They saw this as a reason why there was insufficient "persuasive motivation" for scaling up the farmer-led approach in formal research, extension and education.

Impact on local capacity to innovate

Another important area of impact beyond direct livelihood improvement was the capacity of farmers, individually or collectively, to continue the process of innovation to address other challenges. Nearly all of the cases were positive in describing the enhancement of local capacity as an impact of farmer-led research and mentioned different ways in which this has become visible within the communities.

Strengthened individual capacities. Strengthening of individual capacities, such as confidence, knowledge, and skills to handle experimentation and innovation, was a key feature mentioned in all cases. Men and women who were involved in farmer-led research acquired more knowledge in technological subjects and became more prepared to carry out experiments related to farming. In Case 2, farmers active in the *Campesino a Campesino* activities in Central America became more confident that they could do their own research to find out what suits their situation best. They felt less dependent on external actors to bring solutions. Being involved in the process stimulated the farmers to learn by doing and gradually led to more systematic farmer experimentation.

In Mali (Case 7), being involved in PID led to an increase in the status and self-esteem of both men and women farmers, as they were recognized as innovators by their farming peers and by external research and development actors. The experimenting farmers were eager to continue trying out new ideas and to share the results with other farmers. The evaluators of the Diobass approach in Burkina Faso (Case 6) found a dynamic learning process underway at farmer level, with farmers gradually improving their practices and becoming more creative, more independent and more aware of their own worth. Similarly, farmers involved in POFTs in Ethiopia (Case 11) gained the skills and knowledge to experiment with and evaluate different options. They continued to experiment on their own to find solutions to other problems, venturing into areas of experimentation not covered by the project. These farmers also passed their knowledge on to other farmers.

MASIPAG farmers in the Philippines (Case 3) who had gained skills to become farmer-trainers are supporting and coaching new and less experienced members of the farmer network. In Tanzania (Case 5), farmers who were involved in FPR for a longer period showed greater confidence in sharing experiences, advising and training others on technologies and practices they had tested. In Honduras (Case 8), CIAL members were reported to have a higher capacity for problem identification and solution development and to be confident in performing experiments on their own farms to seek solutions to agricultural problems. Other farmers, including those not involved in the groups, recognized CIAL members as being the "most knowledgeable about agriculture" in the community. Some CIAL members have become skilled farmer-facilitators and are training and supporting others in their communities to engage in research. In Case 4, likewise in Honduras, human capital was strengthened through local experimentation as a critical factor for the villagers to become "subjects" of their own development. In several cases, an increase in diversity of species and varieties of crops grown in the fields and gardens was regarded as an indicator of an expanding inquisitive attitude and readiness to try out new things — in other words, as an indicator of an eagerness to innovate.

Strengthened local organizational capacity. Farmers working and learning together in groups, initially for experimentation and thereafter for other self-initiated activities, led to a gradual increase in local organizational capacity. This featured in nearly all cases as being another indicator of greater capacity to innovate and to combine forces for local development. Working in farmer groups was also part of the strategy in most of the cases in which an external actor introduced a farmer-led research approach. The FPR approach of FARM–Africa in Tanzania (Case 5) was implemented exclusively through farmer research groups. In Honduras (Case 8), the local NGO FIPAH encourages farmer-experimenters to work together in local agricultural research committees. The same applies to the Diobass approach in Burkina Faso (Case 6) and the Kuturaya approach in Zimbabwe (Case 9), where the farmer-led research process has taken place through groups. In Mali (Case 7),

where the PID approach was implemented mainly through individual farmer innovators, it has been observed that these innovators have formed informal self-help networks to address nonagricultural issues as well. A similar observation was made in Case 10 from Vietnam, referring to a network developed by key farmers involved in PTD who formed local interest groups to do joint experimentation. And in Case 11, where the focus of FARM–Africa was on institutionalization of the farmer-led research approach within governmental institutions in Ethiopia, the formation of farmer research and extension groups mobilized farmers in conducting experiments and sharing results and created a sense of togetherness in the community. Also, in cases where farmers themselves took the initiative to engage in experimentation with minimal external support, they opted to establish various groups. The *zaï* innovator in Burkina Faso, for example, set up an association of farmers to further develop and spread the innovation. In the Philippines, MASIPAG farmers involved in experimentation are working through groups called people's organizations.

Apart from technical skills related to agricultural experimentation, members of the groups developed their management and leadership capacities, which in turn gave them respect and recognition in their communities. This was central to the Training for Transformation that supported the Kuturaya activities in Zimbabwe (Case 9). Some of the local groups later expanded their portfolio of activities beyond agricultural experimentation to include aspects such as marketing, labor sharing, savings and credit, and other income-generating activities, as in Burkina Faso (Case 6) and Mali (Case 7). Others have joined forces to lobby for recognition of the needs and rights of smallholder farmers in research and development, as in the case of MASIPAG in the Philippines (Case 3) and *Campesino a Campesino* and the CIALs in Latin America (Cases 2 and 8).

More and better links to sources of relevant information and support. The ability to identify relevant sources of information and link up with support organizations was mentioned in five of the cases reviewed as a feature of enhanced local capacity to innovate. Individual farmers as well as farmer groups are forging these links. In Tanzania (Case 5), farmers involved in the FPR activities established direct links with seed suppliers; the farmer research groups were able to negotiate credit arrangements with wholesalers for seed purchases and to improve their links with a governmental research station and the district extension office. In Zimbabwe (Case 9), farmers established or improved a wide range of linkages with several research stations, the extension service, the national small farmers' union and others. In Honduras (Case 8), men and women farmers reportedly increased their organizational linkages significantly since joining a CIAL, although the specific organizations were not named.

Increased involvement of women. Six of the 11 cases emphasized women's active involvement in farmer-led research processes as a feature of strengthened local capacity to innovate. Rural women who took part in the World Neighbors (2000) study said that their involvement in *Campesino a Campesino* (Case 2) allowed them to break out of their traditional roles, raised their self-esteem and earned them recognition in their communities. Women innovators and experimenters in Mali (Case 7) not only improved their own livelihoods but also became vectors of social progress in their communities. Women involved in the POFTs in Ethiopia (Case 11) became better able to take active part in public meetings, identify their problems and constraints in farming, set priorities, and manage trials. Through their involvement in CIALs in Honduras (Case 8), women could move away from being *conformistas* — those who accept their lot and feel it cannot be changed — and become more assertive and forward-thinking *futuristas* — those with the capacity to aspire for change. Women are active at all levels within the MASIPAG network in the Philippines (Case 3), and a significant number of women have become leaders and plant breeders in the people's organizations.

Creating local spaces for experimentation and learning. Several cases show evidence that deliberately creating spaces for joint learning can lead to enhanced local innovation capacity. Case 1 from Burkina Faso refers to "*zaï* markets" that were organized twice a year, during which people from as many as 100 villages not only shared how they used *zaï* and for what crops,

but also exchanged seeds and discussed ways of using *zaï* pits for new crops or trees. In "*zaï* schools," groups of farmers jointly learned to rehabilitate plots of degraded land. Case 2 on the *Campesino a Campesino* approach in Central America mentions a national symposium of farmer-experimenters, as well as workshops, meetings and field visits that were used to exhibit the farmers' experiments and to disseminate innovations from farmer to farmer. The trial farms set up by MASIPAG people's organizations in the Philippines (Case 3) provide a space for farmer research activities and hands-on learning. In the farmer-experimenter approach in Honduras (Case 4), the farms of farmer-experimenters were the venues where other farmers could visit, exchange and learn. Such farmer exchange visits for sharing and learning among farmers were also mentioned in several more cases. Many cases mentioned field days and farmer fairs being held for this purpose, but did not provide more detail on these events.

General remarks. There is little information in most of the cases as to whether this increased capacity to innovate at local level has indeed led to continued processes of innovation after the CSO intervention phased out. For example, the impact assessment of FARM–Africa's FPR work in Tanzania (Case 5) shows positive impacts of the farmer research groups in terms of local capacity to innovate toward the end of the project in 2007, but there is no subsequent documentation on whether or how these groups continued to work together with other actors in agricultural research and development activities.

Case 3 on the farmer-experimenter approach in Honduras is the only one among the 11 cases that could draw on data from two impact studies made more than 10 years after the intervention ended. These studies indicate that the farmer-experimenters contributed to enhancing local innovative capacity, as evident in the continued innovation in the communities. The 1995 impact study in Honduras revealed that the level of continuing innovation was remarkable after intervention stopped. "Hundreds" of smallholder farmers continued to experiment and develop new technologies in the up to 12 years since an outside agency stopped working in the area. For instance, in San Martin over 30 new technologies and in Pacayas village 16 new technologies had been developed or taken up successfully by farmers after program termination.

The project promoting the Kuturaya approach in Zimbabwe's Chivi District (Case 9) came to an end in 1997. At that time, there were around 33 farmer clubs that had been set up through the project's intervention. Data gathered from several more recent internal documents of ITDG state that the number of farmer clubs in the same area had increased to 70 in 2000, which could indicate that the farmer-led experimentation process has continued. A former ITDG staff member who visited several communities in Chivi District in early 2014 found continued positive impacts of the Kuturaya approach (Murwira et al. 2014).

In contrast, in Burkina Faso (Case 6), only a few of the older farmer research groups — that is, those no longer receiving direct support through Diobass — continued to do research together as a group or to support younger groups in the research process. The reasons for this were not explained in the available documents.

The impact studies on the project to institutionalize a farmer-led research approach in governmental institutions in Vietnam (Case 10) paid little attention to the local capacity to innovate. However, the study undertaken five years after the first phase ended mentioned that some farmers who had been involved in the project-supported activities continued to experiment.

Impact on institutions of agricultural research and development

All the farmer-led research approaches described in the 11 cases have led to some type and extent of change in governmental and civil society institutions of agricultural research and development. These include research and extension organizations at different levels, agricultural universities and colleges, NGOs, farmer organizations, and a range of community-based organizations. In six of the 11 cases, the main path chosen to achieve institutionalization of farmer-led research and development was through governmental institutions. The focus of attention in terms of mainstreaming such an approach in the five other cases was the informal research and development sector.

Governmental institutions of agricultural research and development. Analysis of the cases that sought to institutionalize farmer-led research approaches in formal research and extension reveal that this has been a slow process with limited success. Although some changes in mindsets, skills and knowledge were observed among some government staff members, none of the cases reported significant change in the structures and working mechanisms of the organizations or in budget allocations. The FPR work in Tanzania (Case 5) involved district extension staff as much as possible in the work, and many of them reported that they used findings from the process and from experienced farmers in their extension work. However, the intention of the project to integrate FPR into the extension work of the district council had not materialized by the time the project ended. The evaluators of PROFEIS-Mali (Case 7) reported a change in attitude of those researchers and extension staff at national and district level who were directly involved in the PID, and saw this as a first step toward institutional change. The research being done by the CIALs in Honduras (Case 8), especially in plant breeding, is slowly being recognized by scientists at the regional research facility of the Panamerican School of Agriculture.

In Zimbabwe (Case 9), the collaboration of ITDG and ConTill in developing the participatory extension approach and building capacity of government extension staff to apply it seems to have led to Agritex's acceptance of the approach as part of its repertoire, at least to the extent that it continued to find the manual on the approach important enough to revise and reprint in 2010. During the time of the German-funded intervention in Limpopo Province of South Africa, using the same approach, changes in behavior and attitude were reported in the extension service there. However, because no external impact assessments have been done of the approach in either Zimbabwe or South Africa, it is impossible to state whether it has had any lasting impact on the relevant governmental institutions. At least in South Africa, it appears that the approach was not fully integrated because of internal institutional dynamics, as well as policy changes in extension (van der Lee 2010).

In Vietnam (Case 10), Helvetas sought to integrate the PTD approach into formal agricultural extension and education. The findings of two separate studies on the impact of this work are somewhat contradictory. An impact study made five years after the first phase of the project ended found that PTD had not become a regular part of the extension work, and university lecturers could no longer apply the approach because of lack of funds. They taught it only as a theory, with no field-based practice. However, the internal study at the end of the second phase of the project — made at roughly the same time — reported significant successes: changed attitude of extensionists toward farmers, changes in how governmental institutions worked in terms of two-way communication and participatory planning, and incorporation of PTD into the standard curriculum for training extension staff. Thus, the evidence in Vietnam is inconclusive.

The main aim of FARM–Africa's project in Ethiopia (Case 11) was to institutionalize the FPR approach in governmental institutions of agricultural research, extension and education. Assessment made at the end of the project noted several positive findings, such as increased awareness and knowledge of the approach among staff in these institutions; aspects of FPR integrated into the agricultural college curriculum; willingness of researchers and extensionists to treat farmers as equal partners; and involvement of communities in drawing up research and development plans. However, despite some measure of success, it was concluded that the complex process of institutionalizing the approach could not be achieved within the short timespan of the project.

One exception in this regard is Cuba, where the government has embraced the *Campesino a Campesino* approach (Case 2) and where farmer-promoters work together with Ministry of Agriculture staff. Interestingly, this seems to have come about despite the fact that the *Campesino a Campesino* movement did not focus on integrating its approach into governmental institutions of research and development. This success was probably due at least in part to the isolated political position in which Cuba found itself, which obliged it to draw almost exclusively on its own resources, including the capacities of its smallholder farmers.

Civil society organizations. CSOs engaged in agricultural research and development activities appear to have been more open and receptive to farmer-led participatory

approaches, according to the case reports. Case 2 mentions an array of NGOs and community-based organizations in Central America that practice the main elements of the *Campesino a Campesino* approach — farmer experimentation and farmer-to-farmer extension — in their village development activities. The farmer-experimenter approach (Case 4) has influenced a large number of NGOs in Central America, including the *Campesino a Campesino* movement, to use farmer-led research and extension methods. According to Bunch (1998), this was one reason for a "major movement of soil improvement" on the hillsides of Central America. Bunch (1990) also reports that the farmer-experimenter approach influenced development organizations in countries outside of Central America — such as Kenya, Nepal, India, Indonesia and Peru — that came up with a similar way of working through villager agricultural extensionists.

The cases do not report significant influence of farmer-led research approaches on the well-established regional and national farmer organizations, except in Cuba and Nicaragua (Case 2), where the national farmers union adopted the *Campesino a Campesino* approach. In other Central American countries, some national farmers unions have supported the work but do not appear to have mainstreamed the *Campesino a Campesino* approach in their activities.

Some of the approaches have focused on increasing the autonomy of smallholder farmers, including in agricultural research and development, through their own organizations. For example, MASIPAG in the Philippines (Case 3) managed to strengthen and consolidate its network of farmer groups to become a political movement to influence agricultural policy at national level. Together with other like-minded partners from NGOs and community-based organizations, MASIPAG campaigns for policies that support farmers' control and decisions in matters of agricultural development and research. The CIAL approach in Honduras (Case 8) seems to follow a similar path. CIALs that have strengthened their technological and organizational capacities are joining hands to form associations that are actively engaging with formal and informal research and development actors at regional and national level to gain recognition for their work.

General remarks. It appears that especially international NGOs choose the governmental institutions at national level as the main target for mainstreaming farmer-led research approaches. However, in the cases examined, this process was slower than expected and met more constraints than did efforts to promote farmer-led research approaches among local NGOs and community-based and farmer organizations. If externally funded projects to support farmer-led research had the flexibility to interact with a broader range of actors in both the formal and informal sectors and to adjust the path of institutionalization during the project period, more success could perhaps be achieved in terms of mainstreaming farmer-led research.

The lessons included here are derived largely from the 11 case studies. The study team had difficulty in comparing the experiences across such a diverse collection of cases, but drew out those lessons that appeared to have a wider application than a single case.

The process of and support to farmer-led research

Smallholder innovation is often invisible. All cases show that smallholders are developing innovative technologies that can be applied by other smallholders or at least can inspire them to do their own experimentation and innovation. Many of the low-cost, low-risk technologies that smallholders develop are not easily recognized by formal research and development actors — or even by other farmers, as highlighted in the case of the farmer-experimenters in Central America (Case 4). Already over 30 years ago, Biggs and Clay (1981) stated that most agricultural technology used in developing nations comes out of informal innovation by subsistence farmers. The cases studied here suggest that this still holds true today, whereby "subsistence farmers" include also those farmers who exchange or sell part of their agricultural produce to secure their livelihoods. However, as suggested by these studies and also by the studies under the Joint Learning in Innovation Systems in African Agriculture (JOLISAA) project, this local innovation is seldom recognized (Triomphe et al. 2014a). Richards (1985) attributed the invisibility of innovation in indigenous agriculture to the small-scale and scattered nature of changes made by farmers.

Both "hard" and "soft" innovation by smallholders needs to be explored and supported. Social, economic and organizational innovations, such as new ways of marketing or handling resource-use conflicts, are seldom featured in the cases documented. This could be because such "soft" innovations are particularly difficult to recognize and to subject to joint "experimentation" or because they require inclusion of several actors in the community and possibly beyond, rather than only individual innovators. Another factor could be that joint investigation of "soft" innovations requires involvement of social scientists willing to spend time with the rural community in the midst of an action-reflection-learning-action process to assess and improve the innovation. Whatever the reason, most of the experiences reviewed in this study have involved much simpler processes of joint experimentation on technologies. This suggests that more attention would be required in farmer-led research processes to recognize and deal with the barriers to supporting "soft" innovation, a message that also comes through in the Feldafing Principles (GIZ–CGIAR 2014) and JOLISAA (Triomphe et al. 2014a). The cases also suggest that, even when the focus is on "hard" technological innovation, it would be important to involve a diversity of actors in the farmer-led research — including actors beyond the farmer-researchers and the supporting NGO — to bring in different perspectives and to widen the scope of the innovation process. In any case, every "hard" innovation in agriculture is bound to also entail organizational and institutional changes such as in labor organization, marketing channels, supply mechanisms, etc.

Farmer research groups should be encouraged. Evidence from the cases suggests that farmer-led research is more effective when farmers work in groups rather than individually. This does not necessarily mean that the group members do the experiments jointly, but rather that they reflect together on what kind of experimentation is important for the group or wider community and gain new ideas and suggestions for improving their work through exchange with other research-minded farmers. When the supporting organizations encourage the formation of farmer research groups, these can grow into a wider network of groups engaged in testing the local relevance of new technologies. Some exceptionally innovative farmers — sometimes called "positive deviants"[8] — may feel that their creativity is stifled by the group process, but mechanisms such as grants for individual innovation and experimentation on topics of interest to the community could help stimulate creative individuals. Farmer-researchers working in groups can tackle

a wider diversity of topics that reflect the heterogeneity in the community, and some form of communication among the group members is likely to continue after the intervention ends. Moreover, a network of farmer-researchers — also across national boundaries, such as the group of farmers that conducted action research on the effects of Hurricane Mitch in Central America (Case 2) — allows low-cost data collection and analysis that includes farmers' perspectives, enhances learning among farmers, and can also help identify regional priorities for research.

Short-term wins can stimulate longer-term research. In cases where farmers are involved in research that would produce tangible results only after several years, such as the participatory plant breeding by the CIALs in Honduras (Case 8) or social forestry in Vietnam (Case 10), it is important to incorporate other agricultural research and development activities that bring gains in the shorter term, such as in backyard gardening to generate quick income. Such "early wins" increase the enthusiasm of farmers to experiment and help sustain their motivation to be involved in the longer-term research that will eventually lead to more benefits. This is especially important for involvement of very poor farmers. The approach described in the book *Two Ears of Corn* (Bunch 1982) builds on this premise and appears to have been successful (Cases 2 and 4).

Farmer-led research should encompass both endogenous and introduced innovations. Where local experimentation is only on endogenous innovations using locally available resources (Case 7), the results seem more likely to be relevant for poorer farmers. But such research may limit farmers' possibilities to tap into other, external sources of knowledge and prevent farmers from finding solutions to problems that demand more than local knowledge or from fully exploring new — but locally relevant — alternatives. Cases 2 and 4, for example, show the importance of offering new technologies as ideas to try out without exact specifications, in order to give flexibility and space for farmers to experiment with, to adapt and thus to own the new technology, and also to become better able to explain it to other farmers. Farmers' research on introduced technologies allows the farmers and the intervening organizations to identify major institutional constraints that prevent resource-poor farmers from climbing out of poverty. In a flexible project, this learning process could lead to new activities — such as in market access or policy lobbying — to overcome the constraints. As seen in Burkina Faso and Mali (Cases 6 and 7), farmers' research dealing only with local innovations and ideas, making use of locally available resources, was less likely to reveal such institutional constraints or bring about change, as the farmers develop their technologies within the existing institutional context. However, the technologies that are introduced for testing need to be carefully vetted as to their accessibility for resource-poor farmers.

Introduced approaches to enhance farmer-led research deserve critical reflection and adaptation. The cases revealed that introduced approaches to stimulating and facilitating farmer-led research need to be locally adapted in each country and constantly improved through critical reflection. This calls for good systems of participatory monitoring and evaluation. It would be useful to compare the effectiveness of one approach — such as the Diobass approach, the PID approach or the Kuturaya participatory extension approach — in different countries, as this could help identify more clearly the strengths and challenges of the approach in different institutional and policy settings. Support to the farmer-led research process is likely to be more successful if the supporting agents have good analytical capacities and a readiness and flexibility to learn from their experience and to adjust the approach accordingly. In several cases, the NGOs and farmers involved in the farmer-led research should have given more time to reflecting on the approach so as to improve how they organize the research, record and analyze the findings, and share the results. The supporting organization needs to critically assess how it accompanies the farmer-researchers — such as the length and intensity of accompaniment or the extent to which funds and other resources are provided to the farmers — to be able to improve its support and to avoid creating farmers' long-term dependency on external support.

Sharing and spreading results of farmer-led research

The lessons that can be drawn about scaling out and up pertain to the following: i) sharing and spreading the innovations and other results that came out of the farmer-led research processes; ii) scaling out farmer-led research as a process so that it is practiced by a large number of farmers and other research and development actors over a wider area; and iii) scaling up a farmer-led research approach so that it becomes normal practice within institutions of agricultural research, development and education. These are closely interrelated, but an attempt is made here to divide the lessons into these three categories. This section addresses the first of these three.

Farmer-led research often leads to site- and household-specific innovation. Some of the technologies developed through farmer-led research may be suitable to improve production and generate income only at the site or only in the household doing the local experimentation and may not be suitable for spreading more widely. However, even if an innovation is very specific to a certain site or household, it could still give ideas to other farmers and encourage them by showing how households in a similar wealth class operating under similar general conditions have managed to solve their own problems through experimentation and innovation.

Widely relevant innovations can spread quickly and spontaneously. If a farmer-developed innovation matches the realities and conditions of many farmers, such as *zaï* in Case 1, it is likely to spread spontaneously, and the fact that it does spread in this way would confirm its wider relevance. However, this was rarely monitored by the CSOs supporting farmer-led research, possibly because they lacked the resources to carry out such monitoring or the skills to design methods and tools for it, or because they did not regard it as their mandate. The limited data in the cases suggest that better methods need to be developed and systematically applied to measure the spread and wider impacts — both positive and negative — of the farmer-led research.

More attention should be given to disseminating results of farmer-led research. The cases confirm the need to give focused attention to spreading farmer-developed technologies and research findings so that they become known more widely by other farmers and formal research and development actors. Farmer-to-farmer extension, such as through field visits by groups of farmers to successful farmer innovators and experimenters, is mentioned in many cases as an effective way of sharing results within a community or in neighboring communities. National symposia of farmer-experimenters, such as those organized by UNAG in Nicaragua in Case 2, as well as farmer innovation fairs and farmer-researcher workshops, were also used as tools for disseminating results of farmer-led research from farmer to farmer, increasing farmers' confidence in their own capacities, raising wider awareness in the country about farmers' achievements and stimulating farmers to innovate. During such fairs, attention could be given not only to the farmer innovations and research findings but also to the process of joint experimentation, the way different actors experienced the collaboration, and how the processes and outcomes have been documented and shared. In addition to direct farmer-to-farmer sharing, experimenting farmers could also be supported in farmer-led documentation; that is, in documenting and disseminating their own work, such as through radio, video films, pamphlets, booklets, photo stories, etc.[9]

Address issues of intellectual property rights. In the framework of projects implemented by NGOs, the farmers' research is being paid out of public resources, and the findings are meant to benefit not only the farmers engaged in the research but also other farmers within and beyond their communities. Yet some of the farmer research groups kept their results to themselves because they wanted to reap private profit, such as in Burkina Faso (Case 6). In only two of the cases — MASIPAG in the Philippines (Case 3) and FIPAH in Honduras (Case 8) — did the facilitating CSOs give attention to intellectual property rights issues, in both cases related to national recognition of local breeds and farmer-selected varieties. The issue of patenting may not be relevant or possible in the case of many innovations in crop and animal husbandry and natural resource management, but there may

be instances where this should be pursued. Actors involved in farmer-led research and development would need to consider to what extent the protection of intellectual property rights on locally developed technologies and research findings would stimulate or stifle the innovation process. Organizations promoting farmer-led research should facilitate reflection by the farmers on whether and how the new technologies they develop could be protected and what positive or negative impact this would have on their work and on the livelihoods of other farmers. It would be worthwhile to explore possibilities such as "copyleft" (Douthwaite 2002), which is applied by PROLINNOVA,[10] including in Case 7: PROFEIS in Mali.

Scaling out the farmer-led research process

Scaling out farmer-led research as a process means that it is taken up and practiced by a large number of farmers and other research and development actors over a wider area than where it was initiated. The limited evidence available from the cases supports the view that more emphasis needs to be given to scaling out the process of farmer-led research in addition to disseminating information about the specific innovations produced at different sites during this process. Farmer-led research approaches could lead to long-term impact in terms of farmers' increased capacity to investigate, experiment and share knowledge directly with other farmers. However, as experienced in Honduras (Case 4), it remains a challenge to scale out farmer experimentation as an activity, beyond the farmers originally trained as farmer-researchers and farmer-extensionists.

Start small, gain experience and scale out gradually. The approach taken by *Campesino a Campesino* and World Neighbors in Central America (Cases 2 and 4), based on small-scale experimentation by farmers and farmer-to-farmer extension, gave farmers the confidence that they could "do it themselves." The emphasis on learning by doing makes farmers realize that they can find solutions to their everyday problems while experimenting and exchanging with others; this strengthens their self-esteem and interest in continuing to experiment. FIPAH in Honduras (Case 8) and MASIPAG in the Philippines (Case 3) follow a similar approach.

Stimulating farmers' curiosity versus perfecting their research capacities. Some actors in the formal research sector question the quality of farmer-led research. Is it necessary for farmers to do research that is seen as credible in the eyes of formal scientists? Should farmers' experimentation skills and techniques be made more "systematic"?[11] In Cases 3 and 4, where plant breeding is central in the farmer-led research, the need for strengthening the research skills of farmers was indeed considered important, mainly so that farmer-bred varieties would be recognized in the formal sector. However, the experience in most of the other cases suggests that it is more important for farmers to be motivated to engage in experimentation as a means of learning for themselves and their communities and to become more curious and motivated to tackle opportunities and problems, in other spheres of their lives as well. More emphasis was given in these other cases to generating a strong and broad spirit of experimentation and adaptation to explore new possibilities than to perfecting farmers' research skills. Several of the cases showed that farmer-led research can both generate and harvest existing social energy, inspired by a spirit of solidarity, so that people are willing to think beyond individual or household gains and to invest their own time and resources in activities that also benefit others in the society.

Additional issues related to scaling out are discussed in the following section in connection with scaling up in the informal research sector, as institutionalizing this approach in community-based organizations, farmer organizations and groups, and their networks would lead to scaling it out. Site-specific exploratory and adaptive research would then become recognized as a normal activity of local farmers.

Scaling up farmer-led research as an approach

Scaling up or institutionalizing farmer-led research as an approach involves building capacity of different stakeholders and their organizations to apply the approach as part of their regular activities. This can include integrating the approach into two spheres: i) governmental institutions of research, extension and education; and ii) community groups, farmer organizations or social movements.

Scaling up in governmental institutions. Some of the cases were primarily aimed at embedding the farmer-led research approach within formal institutions of agricultural research, extension and education in the country. Examples are FPR in Ethiopia, Kuturaya in Zimbabwe, PID in Mali and PTD in Vietnam. The premise was that continuation — or "sustainability" — of farmer-led research would depend on mainstreaming the approach into governmental institutions. Institutionalization, as described in these cases, is a complex process that requires capacity strengthening and change in individuals and, through them, change in organizations. It involves several different types of organizations with different cultures, regulations and procedures, which need to learn how to collaborate. In each organization, change has to take place through all layers — not only at the grassroots level and the top but also at all intermediate levels. Thus, if institutionalization is the aim, it appears appropriate to seek broad multistakeholder alliances that jointly develop a clear strategy to integrate the approach.

The difficulties encountered in the process of institutionalization, as described in the cases, also point to ways in which they could be overcome. For instance, when a project tries to introduce a farmer-led research approach into governmental services, it needs to take care that the government staff does not regard the new approach as something separate from the other participatory approaches being introduced by the same or other projects. Such a project would need to seek how the different activities can be mutually reinforcing, such as including the planning of farmer-led experimentation in the wider development planning and budgeting process within the community (Case 10).

Although terms referring to participatory approaches such as PTD, PID, participatory extension or FPR may be included in government strategy papers about agricultural research and development, the ensuing practice may reveal that the underlying principles have not been fully understood. Other components of the research and extension systems may remain oriented to technology transfer. Experiences in the cases suggest that deliberate efforts to expose staff to and train staff in a farmer-led approach would be required at all levels in the governmental services, if it is to be applied in the spirit intended. Systematic participatory monitoring, evaluation and impact assessment — accompanied by frequent reflection on the concepts, approach, methods and processes — would be essential in trying to achieve institutionalization. This was central to the work of FARM–Africa, which set up FPR fora to give government partners space for reflection, peer review and mutual learning (Case 11).

However, the NGO-initiated projects that attempted to integrate farmer-led research approaches into governmental institutions of agricultural research, extension and education (Cases 9, 10 and 11) faced considerable challenges. Lateral learning in the governmental organizations often proved to be weak. High staff turnover and frequent administrative restructuring and change in policies — or in how policies were applied — in the governmental bodies meant that projects had to repeatedly build awareness and capacity in new people in the organizations. Governmental organizations usually had bureaucratic and rigid procedures and financial management, which constrained the flexibility and responsiveness required for supporting farmer-led research.

Scaling up in the nongovernmental sector. The evidence in the cases suggests that approaches to sustaining and expanding farmer-led research that build on community-based organizations, farmer organizations and networks, and people's movements show some promise. For example, training CIAL members in Honduras as paraprofessional farmer facilitators to take over tasks from FIPAH staff has helped to spread the CIAL network to a wider area with strong capacities to facilitate farmer research within the communities (Case 8). MASIPAG (Case 3) is another example of farmers reaching out to more farmers who form a larger farmer organization. The *Campesino a Campesino* approach (Case 2) also sought to scale up through a farmer network and became a movement. Drawing on these experiences, it seems reasonable to suggest that in situations where governmental structures and policies are not conducive to a farmer-led research approach to improving the farming and livelihoods of small-scale family farmers, the most promising pathway for institutionalizing such an approach could be "under the radar" through less formal structures.

In contrast to national and local NGOs, many international NGOs tend to be time-bound, working within the context of relatively short-term, externally funded projects. If they seek to institutionalize farmer-led research approaches, it would be advisable for them to work not only with governmental organizations but also with national or more local CSOs, as these seem to have greater internal drive to continue the research and innovation process — and to continue advocating for change in formal agricultural research and development. Often, people in national-level governmental institutions do not have the same motivation to work on farmer-identified research issues, especially where these are quite site-specific. The farmer-researchers and farmer research groups working on issues of local concern are more likely to find collaborators in other farmer research groups or — if with formal agricultural research and development actors — with those in district-level research centers and extension offices.[12] An international NGO wanting to institutionalize a farmer-led research approach would need to join forces with national CSOs in policy dialogue to promote a decentralization of agricultural research and development activities, which would allow room for local farmer groups and government offices to work on issues that are identified locally rather than at national level. A variety of decentralized farmer-led research activities would be needed to address the very heterogeneous conditions under which smallholder farming is being practiced.

Gender and other equity issues

The evidence in the cases, albeit limited, suggests that conscious and consistent efforts are needed to deal with gender issues and disparities within farmer-led research approaches. Being tagged "participatory" does not necessarily mean that men and women have equal opportunity to take part. As Lambrou (2001) points out, "Participatory research is not automatically gender-sensitive." When too little attention is given to gender and other socio-economic differences in the farming community, the farmer-researchers with which the project works usually do not include the very poor and marginalized community members and tend to be mainly men. In such cases, results of farmer-led research and development are less likely to suit the conditions of women and poor farmers. The case of *zaï* in Burkina Faso (Case 1) shows that land-based experimentation by better-off farmers may not generate innovations feasible for the very poor. However, MASIPAG in the Philippines (Case 3) has shown that farmer-researchers can develop seed-based innovations that also benefit the poorer farmers. In the case of the work of FIPAH in Honduras (Case 8), a timely socio-economic assessment, close observation and conscious adjustments helped make the CIAL methodology more inclusive and opened up spaces for marginalized groups, including women, to be actively involved in farmer-led research and development.

Roles of formal agricultural research, advisory services and education

Supporting ongoing local innovation. Useful innovation in farming is happening without support from formal science. However, scientists can play important roles in innovation processes. In the case of *zaï* in Burkina Faso (Case 1), scientists played two main roles: i) documenting and making more widely known what innovative farmers were doing; and ii) validating the technology in scientific terms to make it more credible in the eyes of research and development decision-makers and donors. In the MASIPAG partnership in the Philippines (Case 3), scientists started by building farmers' capacity in small-scale experimentation but now play a supportive and facilitating role, sharing their knowledge and skills with farmers and enabling them to continue research on their own. MASIPAG shows the importance of creating an organizational culture that is highly respectful of farmers. It could be beneficial if some scientists are on the staff of the supporting NGO. For example, in FIPAH's work with CIALs (Case 8), the agricultural scientists in the NGO won the respect of the farmers as well as of scientists in the formal agricultural research and development sector, who regard the CIAL approach to plant breeding as credible. This facilitated the partnership of the farmer-researchers with formal scientists and helped FIPAH and the CIALs have an impact on seed production and genetic resource conservation at the national level.

Particularly in the case of complex experiments involving many factors, it would be important that formal researchers collaborate with farmer-researchers to provide technical support and help them understand better which factors affect the outcomes. In most CSO-facilitated farmer-led research, the CSOs did not document the findings; they relied mainly on farmer-to-farmer sharing through visits, fairs and other oral forms, such as radio. An important support role of formal research could be to systematize the results from farmer-led research, including analysis of quantitative data. Scientists could also bring in knowledge and options from formal research into the farmer-led research process; a lack of this is mentioned in the Diobass case in Burkina Faso (Case 6). These scientists could also play an important role in sharing their farmer-led research experiences with colleagues within their institutions and in helping their colleagues appreciate the importance of facilitating processes that empower farmers.

However, scientists are likely to be attracted to work with farmer-researchers only if farmer-led research is presented to the scientists in a way that stimulates their personal interest as well as the interest of their institutions to fund the collaboration. Ideally, resources for the collaboration could be made available through a fund controlled by a community-based or farmer organization or by a multistakeholder body with strong representation of male and female smallholder farmers, so that there would be less danger of the scientists or richer farmers taking over control of the research.

Advisory services play a key role in facilitating linkages. Agricultural advisors can provide a valuable service in linking farmers with a wide range of relevant sources of information and collaborative support. Other roles for advisory services in facilitating farmer-led research and innovation processes include organizing visits between farmers and providing funds and coaching to help innovative farmers train other farmers.

When field-based extension officers are closely involved in CSO-facilitated farmer-led research, they can gain confidence to question the conventional approach taken by their organization and to suggest improvements toward a more farmer-led approach. This can create pressure from below at the same time as the CSO is engaged in policy dialogue about the farmer-led approach at higher levels in the organization. ITDG found this strategy to be key in stimulating institutional change within Agritex in Zimbabwe (Case 9).

To the extent that farmer-led research is integrated into decentralized government plans for research and development, it would be advisable to make a budget available to support farmers' experiments, including a mechanism to reduce risks by compensating farmers for losses incurred if an experiment fails. Decisions about criteria for accessing such funds need to be made at the lowest level possible.[13]

Integrate farmer-led research into education and training. As noted in several cases, if agricultural researchers and advisors are to play the roles described above, they need basic orientation in and capacity to recognize farmer-led research and innovation, as well as to facilitate participatory processes of identifying priority local initiatives to support, as it would be impossible for them to support all the innumerable cases of farmer innovation.

The conditions for partnership of farmer-experimenters with other interested actors — whether in the public or the private sector — could be improved by introducing farmer-led research concepts and methods into the curricula of educational institutions. In this way, a larger number of future researchers, extensionists and private-sector actors, including formally educated farmers, would develop the attitudes and behavior needed to support farmer-led research. It is especially important that as many students as possible have a chance to experience on-the-ground collaboration with innovative and experimenting farmer groups. This lesson was also emphasized during the international workshop on Agricultural Innovation Systems in Africa held in Nairobi in May 2013 (Triomphe et al. 2014b): Education and training institutions need to interact closely on the ground with farmers, rural communities, entrepreneurs, advisors, and research and government staff so that the graduates will be capable of playing useful roles within agricultural innovation systems.

Roles of civil society organizations

Capacity strengthening. The CSOs in the cases put a strong focus on strengthening capacity for farmer-led research. For example, the work of MASIPAG (Case 3) in building competences and mutual support enabled farmers to take up a range of roles and responsibilities and to function in different capacities across the network and beyond. This helped build a large pool of farmers with expertise in plant breeding, training, leadership, entrepreneurship, etc., who can sustain the network. Some international NGOs that sought to integrate farmer-led research approaches into governmental services, such as FARM–Africa in Tanzania and Ethiopia and Helvetas in Vietnam, gave too little attention to strengthening organizational capacities at the grassroots level. In southern Ethiopia (Case 11), it was only very late in the project for institutionalizing FPR that FARM–Africa recognized the importance of community-based groups to continue research and extension where governmental services remain weak.

The cases also showed the importance of strengthening both technical and socio-organizational competences. For example, FIPAH in Honduras (Case 8) trained farmers not only in systematic plant breeding but also in organizational development; this helped make the farmers more confident and assertive as active community members able to express their views and make collective decisions. Much of the power of the Kuturaya approach in Zimbabwe (Case 9) lay in integrating training in experimentation skills with Training for Transformation — organizational development, leadership, financial management, public speaking, etc. These latter skills were further strengthened through collective activities such as group marketing, bulk purchasing of inputs, and operating savings and credit groups. This integrated approach led to increased social capital: The rural communities became better able to organize themselves to innovate, as is evident from the continued development work by farmers in Ward 21 (Murwira et al. 2014).

Facilitating linkages through paraprofessionals. Several cases showed the importance of preparing local paraprofessionals to take over the role of supporting NGOs in promoting farmer-led research (particularly Cases 2, 4 and 8). Maintaining the momentum and spread of such an approach would depend on self-driven networks of farmer-researchers-cum-extensionists or "promoters." NGOs could still continue to play a role in working with paraprofessionals in linking farmer groups so as to create space for farmer-to-farmer sharing and learning. A review of the sustainability of paraprofessionals such as community-based extensionists several years after support by the UK-based NGO Practical Action — formerly ITDG — had ceased in Bangladesh, Kenya, Peru and Sudan likewise revealed the importance of these community-based workers in building the capacity of farmers to investigate and solve their own problems using locally available resources and to conduct their own experiments to adapt new technologies to their local conditions. The training in experimentation increased the paraprofessionals' own capacity to innovate, and they passed on knowledge from their experiments to other community members. However, they did not appear to have passed on any training in local experimentation to the other farmers (Warburton et al. 2013). The Promoting Multifunctional Household Environments project in Sri Lanka, which ran from 1991 to 2000, built the capacity of a group of village-level extensionists and facilitators who supported their communities in a variety of activities, including farmer experimentation (Wettasinha 2001). During a visit to the project area in 2011, more than 10 years after the project ended, it was found that several of these village extensionists were continuing their work in the communities and even encouraging others to take on similar roles (C. Wettasinha, personal communication, 2014).

Stimulating collective action. Encouragement and support provided by national and local organizations of smallholder farmers play a key role in spreading a farmer-led research approach, such as with *Campesino a Campesino* in Central America (Case 2) or MASIPAG in the Philippines (Case 3). A great strength of the *Campesino a Campesino* approach is the link between innovation and solidarity. The farmer-promoters are committed beyond their own families to a wider community to fight against poverty or oppression. Sharing knowledge is a moral commitment in this cultural context. Farmers improve their agriculture through collective processes of innovation, and the community values the farmer-experimenters' knowledge and experience. This, in turn, contributes to their own self-

esteem and motivates them to continue their experimentation and sharing. This also supports the findings in the ITDG study of community-based paraprofessionals: They were strongly motivated by their desire for knowledge and their feeling of obligation to the community, and the latter appeared to be particularly strong in more remote areas (Warburton et al. 2013). The role of social capital — motivation, networking capacity, trust and ownership — as an engine in the farmer-led research process should not be underestimated. It is this quality that perhaps makes such approaches more successful in the informal than the formal research and development sector.

Advocacy. Where the political conditions allow, the farmer organizations and NGOs can form networks and rise "above the radar" to use their experiences in policy dialogue and advocacy to maintain or expand the space to continue farmer-led research and development. This was particularly evident in the way the farmer-led research activities and accompanying capacity strengthening in MASIPAG (Case 3) gave smallholder farmers the confidence to campaign for organic farming and farmer-led plant breeding. It is the exception rather than the rule that CSOs enjoy conditions such as in Cuba (Case 2), where they can work together with a supportive governmental structure, and where agricultural scientists and technicians work in a decentralized way with many rural cooperatives to help farmers adapt practices quickly to specific agroecological conditions in different parts of the country. In most cases, the struggle to gain official acceptance of a decentralized, farmer-led approach to agricultural research and development continues.

Roles of funding agencies

In most cases, external funding was provided for initiating or strengthening the farmer-led research process; this was undoubtedly because the study team selected cases that involved outside intervention in the ongoing farmer-led experimentation and innovation processes. The volume and the modalities of funding differed substantially and — as would be expected — tended to be much higher in the cases where the CSO was trying to institutionalize a farmer-led research approach rather than to apply it at grassroots level in a limited area.

External funding proved to be particularly important in the case of longer-term farmer research that brings returns only after several years, such as the work on seed by MASIPAG in the Philippines (Case 3) and by the CIALs in Honduras (Case 8). Small but consistent external funding over several years, indeed decades, enabled the supporting NGO to build close and strong ties with the communities and to provide the intensive training, mentoring and facilitation demanded by farmer-led research approaches in the early years. The German church-based organization Misereor has funded MASIPAG for over 20 years, and Canadian donors have funded the work of FIPAH with CIALs in Honduras for 18 years. This long-term commitment of donors that recognize the value of a farmer-led approach helped the farmers slowly but surely build up the capacity of their networks. External funding for farmer-led research that is beyond the means of the farmers and CSOs themselves may be justified as a continuing contribution to the development of smallholder farming, as it is generating public goods in the form of site-appropriate innovations and strengthened capacity of smallholder farmers to innovate and improve their livelihoods and conditions; this is a complement to funding for formal agricultural research and development.

CSOs supporting grassroots farmer-led research (such as in Cases 2 and 4) report that small amounts of funding at this level can have important leverage, by allowing farmers to travel to gain ideas, to meet other experimenting farmers, and to share their research experiences and results in person within their countries and regions.

The prevailing mechanisms for external funding of farmer-led research processes are oriented toward project cycle management, which can constrain the flexibility and creativity of partners in the innovation process to take a reflective approach and adjust the strategy and form of support given to the farmers. There may also be some misunderstanding among the CSOs that the donors are not open to a flexible approach.

If the aim is to institutionalize farmer-led research within governmental structures, then the experiences described in Cases 9–11 suggest that donors need to give much more time — not necessarily higher levels of

funding — to achieve this. Considerable time is needed to build up partnerships, generate convincing evidence on the ground, and engage in reflection and de- and re-learning at the various levels — up to national ministries — so as to bring about the necessary change in attitudes, behavior, institutional structures and procedures, including incentive mechanisms. To be able to provide the sustained support needed for institutionalizing farmer-led research approaches, longer funding cycles with differentiated funding arrangements are needed.

In line with this, the Feldafing Principles for Enhancing Agricultural Innovation Systems (GIZ–CGIAR 2014) refer to the need for a long-term perspective to allow innovation dynamics to develop.

Farmers discuss PTD experiment in Dak Tih Commune, Dak Nong Province, Vietnam

Assessment of the case-study evidence

Most of the documentation on farmer-led research cases that the study team managed to find was not available on the Internet, let alone in double-refereed journals. Some of the documents were so "gray" that they had to be sourced primarily through individuals who have or had some affiliation with the case. Regarding the work of World Neighbors and *Campesino a Campesino* in Central America (Cases 4 and 2), the several documents reviewed were authored in each case by only one person who was closely involved in the case. Both of these persons were also very responsive in providing additional written information by email.

However, it was not always possible to find an informed insider — even in the case of more recently completed projects — who could give details about continuation of farmer-led research or of institutional support to this research after CSO intervention had ceased. In some cases where "living insiders" had been identified who could provide further insights and up-to-date information on the case, their responses to our queries were not received in time to be incorporated into this report.

In most cases, some of the information that was requested in the format for writing up the case studies could not be found in the available documentation. For example, very few data could be found that would allow an assessment or even an estimate of the cost of farmer-led research approaches per farmer reached. In only two of the 11 cases did the documents refer to such costs. The figures were very rough, but suggest a high impact with a small budget. In Central America, the cost per farmer who adopted some technology from the volunteer extensionists in the *Campesino a Campesino* program (Case 2) was reportedly about US$ 50. The external evaluators of the Diobass work in Burkina Faso estimated that it cost about EUR 45 per indirect beneficiary over three years for the farmer research groups to produce innovations useful for smallholders.[14]

The criteria related to the quality of documented evidence of impact were the most difficult to meet. One criterion for short-listing cases for inclusion in the desk study was the existence of at least one document, either an evaluation or an impact assessment, that would give an external perspective on the farmer-led agricultural research and development approach and its outcomes. Table 1 gives an overview of the type of evaluation or impact assessment documentation that could be found for the 11 cases. As can be seen, in only a few cases could evaluations or impact assessments — published or otherwise — be found that had been made by people external to the farmer-led research process. Most assessments were made either by people closely involved ("insiders") in a team with one outsider, or by insiders only. When participatory impact assessment approaches were applied, such as the study of the Hurricane Mitch aftermath in Central America (Case 2), the learning by those involved was intensive, but the quality of the data was difficult to control. In such studies, scientists who are open to participatory approaches and can apply systematic methods of data collection and analysis in this context could play a very important role.

Some external impact assessments were made immediately after completion of the project, such as the FPR work supported by FARM–Africa in Tanzania and Ethiopia (Cases 5 and 11). Some attempts to assess impact were included in project-completion reports by the NGO implementing the project, such as the PTD work in Vietnam (Case 10). An assessment five or more years later would have provided a better picture of the extent of genuine institutionalization of these approaches and whether and how they impacted on farming communities and the governmental institutions meant to serve them. Where an impact assessment was indeed made five to 20 years after the end of project intervention, this was usually by people who had been involved in the project or who were "outsiders" coming from the same or an affiliated NGO. This doubtless happened when project staff or donors preparing the evaluation wanted to be sure that the evaluators had a good understanding of farmer-led research approaches. As mentioned earlier, some evaluators without this understanding tended to look only at the extent of technology dissemination.

The requirements of the donor usually influenced the design of the evaluation or impact assessment, such as looking at impact only in terms of institutionalization, spread of technologies or increase in incomes but not in terms of change in local capacity to innovate. The CSOs themselves often do not have the means to arrange for independent evaluators to carry out a different kind of assessment than that required by the donors, and, if such an assessment was done at all, it tended to be done by people closely involved in the work. It was therefore impossible in this review to avoid using findings that might be considered "biased."

No.	Name of case	Evaluation or impact assessment of ongoing activities (no. of years after intervention started)	Impact assessment at end of intervention	Impact assessment (no. of years after intervention ended)
1	Farmers developing and disseminating *zaï* in Burkina Faso	External (18 years)	n/a	n/a
2	*Campesino a Campesino* in Central America	Internal (13 years)	n/a	n/a
3	MASIPAG (Farmer-Scientist Partnership for Agricultural Development) to promote farmer-led sustainable agriculture in the Philippines	External + internal (22 years)	n/a	n/a
4	Farmer-experimenters in Honduras	-	-	Internal (15 years) Internal (20 years)
5	Farmer participatory research in Tanzania	-	External	None
6	Smallholder action research in Burkina Faso	External (22 years)	n/a	n/a
7	Participatory innovation development in Mali	External (6 years)	n/a	n/a
8	Local agricultural research committees (CIALs) in Honduras	External + internal (10 years)	n/a	n/a
9	Kuturaya participatory extension approach in Zimbabwe	-	Internal	None
10	Participatory technology development as an approach to extension in Vietnam	-	Internal	External (5 years after Phase 1)
11	Institutionalizing farmer participatory research in southern Ethiopia	External + internal (4 years)	External	None
n/a: not applicable because the intervention is ongoing				

Table 1. Evaluation and impact documentation available for each case study.

In those cases (Cases 9–11) where the main aim of the CSO intervention was to institutionalize farmer-led research within governmental services, the assessment looked mainly or only at impacts in these services but not at impacts on individuals, households, informal farmer groups or communities at the grassroots level, or in any farmer organizations or CSO networks that may have been involved. In some of these cases, the farmers monitored and recorded the experiments they were conducting, but a different kind of monitoring, evaluation and impact analysis would be needed to discern impacts of the farmer-led research approach on strengthening farmers' and communities' capacities to innovate and to improve local livelihoods.

There are likely to be such "hidden" impacts outside the formal agricultural research and development sector that was the target of the institutionalization efforts. As a result of the intervention, some farmer groups or community-based organizations may have begun to interact more intensively with other research and development actors at the local level, such as field-based extension agents, scientists in nearby research stations, instructors in nearby colleges or local government administrators, but — because this was not the focus of the impact assessment — it did not become evident. The study by Fanos et al. (2011) in northern Ethiopia revealed that — even in a setting of fairly top-down extension in the Tigray Government, where institutional change to embrace farmer-led research was not evident — the experimenting farmers and the local research center, university and extension staff at district level managed to create their own spaces to identify local innovations and engage in joint experimentation. To generate this kind of evidence, similar local-level studies would have to be made in other areas where interventions were aimed at institutionalizing farmer-led research.

Another aspect that was poorly documented was whether and how the farmer-led research process was taken up by other farmers who were not directly involved in the intervention. Some of the cases, such as *zaï* in Burkina Faso and soil-improvement practices in Central America, documented the spontaneous spread of the results of the farmer-led research to others, but there was no sound evidence provided in any of these cases that the farmer-led research process had also spread in the same way.

An overall lesson from this desk study is the following: If CSOs want to have solid evidence to advocate for wider application of farmer-led research approaches, they need to pay much more attention to high-quality documentation of outputs, outcomes and impacts, preferably including independent evaluators in the impact-assessment team. In particular, better methods need to be developed to provide evidence about the impact of such farmer-led research approaches on local organizational development and capacities to innovate and adapt. Systematic documentation of farmer-led research serves not only to convince "outsiders" in research, extension, education, policymaking and funding agencies; it also serves as a tool for learning at different levels. Joint documentation makes the partners more aware of what is happening in the farmer-led process.

Similarly, in their research into impact indicators for grassroots innovation and farmer-led experimentation in South Africa, Letty et al. (2012) found that insufficient attention is given to the systematic collation of information about inputs, actors and impact of individual cases, and that little effort is made to aggregate the information across cases and countries. They note that, where indicators are being used to describe innovation processes in agriculture, these indicators do not shed light on grassroots innovation in the "informal economy." The focus is on inputs and formal research and development actors, and only limited types of outputs are measured, such as productivity levels. Little attention is paid to long-term impacts on livelihoods, particularly the social and economic impacts, including empowerment and "intensified innovative activity." They call for an endogenous process of developing relevant indicators for longer-term impacts of supporting grassroots innovation processes, including case studies and smaller surveys to inform larger national surveys.

The project mode of the interventions of international NGOs in particular in promoting farmer-led research means that, once the project has ended, no staff and no funds are available to monitor what happens afterward. A systematic review of innovation grants advises donors to commission more impact evaluations

that capture changes in innovation behavior beyond the project implementation period, requiring data collection over an extended period (Ton et al. 2013).

In their systematic review of farmer field schools (FFSs), in which farmer-led research was meant to play a key role, Waddington and White (2014) found that the impact studies seldom looked at a wider range of outcomes, such as farmer empowerment and environmental impact. They stated that FFSs may be justified through their contribution to enhancing farmers' adaptability and resilience to shocks, but this type of evidence was not available. Teams doing impact studies did not have access to or did not collect data to allow analysis of the causal chains underlying the impacts. The same could be said of the documentation available for this review of CSO-supported farmer-led research.

Assessment of the analysis of the cases

One aspect that would have deserved more critical scrutiny and categorization in the analysis of the cases is the degree to which the approaches identified as "farmer-led research" were indeed farmer-led. This was difficult to assess, especially because the documents available for the desk study seldom mentioned the power and decision-making issues that must have arisen within farming communities and farmer organizations and between these groups and external actors.

In some cases, the facilitating CSOs seemed to play a fairly strong role in suggesting the type of technology that farmers could or should explore. For example, World Neighbors and the *Campesino a Campesino* movement (Cases 4 and 2) put a strong emphasis on soil amelioration, whereas the local farmers would not have chosen on their own to conduct experiments on green manures, because they were not familiar with them. Indeed, after project intervention ceased, the farmers tended to experiment more with new crops and with pest and disease control in plants and animals. However, this may have been because their earlier soil-related work had been successful and other limiting factors in the farming system had emerged. Likewise, FARM–Africa (Cases 5 and 11) offered a menu of introduced technologies developed by formal research, and provided the required external inputs free of charge to farmers who wanted to test or explore these technologies in POFTs. Thus, "farmer-led" meant that farmers were free to choose from among options offered by the facilitating CSO as topics for experimentation.

Another concept of "farmer-led" would be that farmers pose their own questions in the experiments and use their own criteria to assess the results. This indeed happened in all the cases studied, including those that involved the testing of introduced technologies. In other cases, however, it was much clearer that the experimentation was farmer-led, because the facilitating NGO identified innovations already developed by local farmers, which they and others wanted to explore or refine, such as PROFEIS in Mali (Case 7) and Diobass in Burkina Faso (Case 6). When the CSOs did make links with scientists to support the farmers' experiments, there was still a need to ensure that the scientists did not take over the research process, but there was a high likelihood that the main topics and questions were coming from the farmers.

There is good justification for a process that is less farmer-led to introduce issues that may be less obvious to the farmers. World Neighbors used experimentation with "quick-win" introduced technologies to gain the confidence of the farmers and to stimulate their enthusiasm to experiment further. In the case of PROFEIS–Mali, the approach of identifying local innovations as starting points for joint experimentation was an effort to increase farmers' pride in their own ability to solve problems with locally available resources and, through giving recognition to local creativity, build a more balanced partnership between farmers and scientists. The farmers would then be more open to also explore ideas coming from formal research, and the scientists to explore ideas coming from farmers' research.

The analysis was very focused on the 11 cases selected for deeper study. The study team did not have the time to return to the other 30 cases that emerged from the first round of selection and to capture additional insights and lessons from them. These cases had been filtered out because they had no documented evidence of impact, but this does not mean that the approaches and experiences were without value for a study of CSO-supported farmer-led

research. Many CSOs have documented the participatory approaches they are promoting, but documenting evidence of outcomes and impact of farmer-led research is very weak in the CSO sector — and possibly also in the formal agricultural research sector, but this was not the focus of our study.

Also not included in the analysis are cases of informal agricultural research and development by farmers that have been documented, for example, by anthropologists, but that did not involve any intervention by CSOs.

Upon the suggestion of one of the members of the advisory group, this final section of the report includes a few references to how the findings and lessons from the cases confirm what can be found in the literature, but the time available for this study did not allow for a systematic review of all the literature on farmer-led research and development.

Photo credit: Omar Gallardo/FIPAH

CIAL members laying out an experiment in Honduras

SUGGESTIONS FOR FURTHER STUDY

The findings of this study indicate a number of key areas related to the impact of farmer-led research that merit deeper investigation in order to sharpen this initial analysis, to draw more grounded conclusions, and to gain a greater understanding of farmer-led research and development processes and how they could be enhanced.

1. **Expanding and deepening insights into impact**. As can be seen from the documentation available for the cases identified during this study, there is a scarcity of systematic, independently verified evidence on impact in farmer-led research supported by CSOs. Where information on impact was available, it was often generated by people who are or were closely involved in the intervention, and it covered only certain aspects that were interesting to them. In many of the assessments, gender and equity issues received little or no attention. Conducting independent impact studies on a selection of cases from this study, such as in Zimbabwe (Case 9) or Vietnam (Case 10), would contribute substantially to strengthening the initial analysis presented in this report. It would also be useful to make impact studies of a few particularly interesting cases from the long list of potential case studies (Annex F) that were not included in the short list because the impact data available were not considered to be strong.

2. **Spread of informal to semi-formal farmer-led research processes**. Sustainable livelihood improvements are realized not only through improved practices and technologies coming out of the farmer-led research, but also — and particularly — through the strengthening and spread of the local experimentation and innovation processes. This raises several new and challenging sets of closely related questions on several topics:
   - **Capacity to innovate**. What factors determine the concept of local capacity to experiment and innovate? What are the implications of distinguishing between capacities of individuals, communities and agricultural systems? How do the elements and determining factors of capacity to innovate identified through this desk study — and those identified by other professionals[15] — compare to how smallholder farming communities and supporting CSOs view innovation capacity in their practice? What implications do these possible differences in perception have for the way formal research organizations should interact with and support local innovation processes?
   - **Spread of farmer experimentation**. Do farmers who were not directly involved in the interventions related to farmer-led research become interested in starting or intensifying their own experimentation? What triggers this to happen? To what extent and why do such interested farmers expand their efforts in experimentation and innovation? How can one monitor and assess whether this process of farmer experimentation is spreading?
   - **Community-based paraprofessionals**. What roles do paraprofessionals play in supporting and spreading local experimentation and innovation and in continuing to link communities with other research and development actors after the intervention has ceased? What kind of training is useful to them during the intervention to increase the likelihood that they or others would continue to play this role? For example, do they need to be trained in experimental techniques to become local researchers recognized by formal agricultural researchers, or should they be trained more in leadership and community development or other aspects that help maintain local capacity to innovate? How can their functions continue to be financed and by whom at what level? What conditions would stimulate them to support the ongoing dynamics of local experimentation and innovation?

- **Socio-institutional innovation**. Why does socio-institutional innovation seldom feature in CSO-led efforts to promote farmer-led research? What are the barriers to recognizing such innovation? How can processes of socio-institutional innovation be better supported in connection with technological innovation? What additional skills and competences are required for facilitators of such processes? How can facilitators of farmer-led research develop these skills and be better equipped to support, monitor and evaluate socio-institutional innovation?
- **Gender and equity issues**. Why is there limited participation of women and poorer households in many of the documented farmer-led research cases? What type of innovation development is better suited to poorer or more marginalized groups? How can such processes be supported? What barriers need to be recognized and addressed in enabling women and poorer households to engage in and benefit from farmer-led research?

3. **Integrating farmer-led research into governmental institutions**. Despite persistent efforts over many years, such as in Cases 9–11, to integrate a farmer-led research approach into governmental institutions of research, extension and education, the approach does not appear to have been continued at national or provincial level — even after it was integrated into extension policy documents as in Case 10. Deeper study is needed into the reasons why such carefully planned and implemented strategies to institutionalize farmer-led research within governmental services have met with only limited success, and what can be learned from partially successful efforts at least at the local level, such as in Zimbabwe (Case 9; Murwira et al. 2014).

Deeper investigation of these three key areas and subthemes would require research approaches that are tailored to the different and specific issues to be addressed in each of them. This could be a combination of well-structured and focused independent impact studies with other mixed forms of investigation to elicit local views on the capacity to innovate or to assess processes of institutional change. In each situation, the people who will be involved in such investigations and the countries to be covered might differ. A careful analysis of the different components that need to be included and how they can or cannot be combined will lead to planning of the next steps and activities.

It should be possible to organize such further studies in a decentralized manner, commissioning and involving relevant interested NGOs and farmer organizations, as well as international and national research organizations. If there is interest in drawing out lessons across cases and countries or even continents, then a coordinating organization at the appropriate level could be given the task of developing a common framework and providing backstopping in using it, as well as facilitating joint comparison and analysis. This process could include studies by master's and doctoral students on the impact of farmer-led interventions at the local level, which would also help to integrate concepts of farmer-led research into institutions of higher education.

In view of the promising activities that seem to be continuing in rural communities "under the radar" of formal research and development and the need for better understanding of the dynamics involved, scientists in international and national research organizations could gain important insights and play an important role in analyzing and documenting such cases of endogenous and CSO-facilitated farmer-led research. A process of joint analysis and documentation would make all the participants more aware of what is happening in the process and help them identify ways in which farmer-led research and development could be enhanced.

In addition, action research into these questions could be conducted in the midst of ongoing research and development processes and could involve all stakeholders — including the local communities — in learning about the process. This kind of research could be integrated into the CGIAR research programs at their action-research sites, with participatory monitoring and evaluation systems for reflection, learning and making corrections during the course of action.

In order to have a "bigger picture" in assessing farmer-led research approaches, it would be good to look at how the farming systems have evolved and adapted over time in areas where farmer-led research activities have been going on and to examine how these activities are related to and may have contributed to broader change processes.

It would be useful to give more attention to what can be found in the literature on farmer-led research in order to enrich and contextualize the findings from the case-study analysis and future studies as described above. For example, a coordinated multiple-country study into the role of community paraprofessionals could link to and build on the work by the Overseas Development Institute (ODI) on farmer-led extension (Scarborough 1995).

Follow-up studies should include a closer look at the 30 cases from the "long list" (Annex F) that were excluded from this analysis because documented impact data were lacking. Several of these cases may yield important information and lessons related to the key areas and questions mentioned above — and also about the actual and potential role of formal researchers in strengthening farmer-led research and development processes.

Seed storage by MASIPAG farmer researcher in the Philippines

NOTES

[1] PROLINNOVA: PROmoting Local INNOVAtion in ecologically oriented agriculture and natural research management (www.prolinnova.net).

[2] In this text, whenever the term "farmer-led research" is used, it refers to "farmer-led agricultural research and development" as an inextricably intertwined process. Because the full expression would be too long to write out each time, we use the shorthand "farmer-led research," but we are fully aware that this is embedded in the farmer-led development process.

[3] Biggs and Clay (1981) distinguished between formal and informal agricultural research and development. In the informal sector, farmers are continually experimenting and innovating. Biggs (1989) refers to "the omnipresent informal experimentation, plant selection and other research activities of 'research minded' farmers … taking place in all agrarian societies" (see also Biggs 1980). Buhler et al. (2002) trace the gap between formal and informal research back to colonial times, when almost all research related to staple food production in the colonies was carried out by farmers, while the formal research sector focused on cash crops.

[4] The international secretariat is hosted by the NGO ETC Foundation in Leusden, The Netherlands.

[5] "FARM" was originally an acronym for "Food and Agricultural Research Management." The organization has since changed its name to "Farm Africa."

[6] For example, Chuma and Hagmann (1995).

[7] This was according to a project internal review. However, an external impact assessment in the same year (2006) found only limited spread of the practices tested by farmer research groups in the project area.

[8] See Pant and Odame (2009).

[9] See van Veldhuizen et al. (2011).

[10] PROLINNOVA's copyleft statement: "Anyone may use the innovations described here and modify or develop them further, provided that the modified or further developed innovations or any follow-up innovations, of which the innovation described here is an element, are likewise freely available and any description of them includes this proviso and acknowledges the source of information" (see intellectual property rights under http://www.prolinnova.net/content/prolinnova-guidelines).

[11] Stolzenbach (1999) points out that, since the nature of farming is adaptive performance, informal experimentation by farmers is — almost by definition — not very systematic. "Scientification" of farmers' research would miss the point. However, experimenting can serve as a linkage mechanism to facilitate communication. By showing and discussing their experiments, participants are stimulated to make their knowledge explicit — that is, in a form that can be shared. Informal experimentation can provide a concrete setting for joint analysis and can contribute to "social learning."

[12] See Fanos et al. (2011).

[13] See van Veldhuizen et al. (2012).

[14] The calculations made in the evaluation of the FPR work in Tanzania (Case 5) and the work of MASIPAG in the Philippines (Case 3) refer only to the cost effectiveness of the technologies tested but not to that of the farmer-led research approach.

[15] See, for example, Leeuwis et al. (2014).

[16] Includes only references cited in the main report; references for the case studies are given at the end of each study in Annex H.

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ANNEX A: CONCEPT NOTE FOR THE STUDY

Study on impacts of farmer-led approaches to agricultural research and development (FL-ARD) supported by civil society organizations

Much of the food consumed in the world today is produced by millions of smallholder farmers — a term that includes crop farmers, fishers, livestock keepers and other natural resource users — mainly in the Global South. The formal agricultural research and development (ARD) sector is made up of a large group of international, regional and national agricultural research centers, academic institutions and extension agencies that are mandated to engage in ARD that supports and sustains the livelihoods of these smallholder farmers. Despite considerable public funding for this research over several decades, the formal ARD sector is often not producing research outcomes that bring the intended benefits to its target groups.

Donors, policymakers and civil society organizations (CSOs) are exerting mounting pressure on the formal ARD sector to find ways to make its research more relevant and useful to smallholders. This is driving change within the formal ARD sector, including the CGIAR system, and many ARD institutions are now seeking ways of tuning into the needs and aspirations of smallholders and engaging with them more meaningfully. Some researchers within these institutions are exploring ways to make their research more relevant for and accessible to smallholder farmers and are looking for examples and good practices to learn from, as well as practitioners from the "informal" ARD sector to partner with.

Examples of ARD that is more focused on smallholder farmers, where the research process is co-managed and driven by smallholders and is participatory by design, are largely in the "informal" ARD sector with CSOs as the main facilitators. Information on the process and outcomes of these initiatives rarely appears in the "formal" ARD literature, such as double-refereed scientific journals. Most of the documentation of these examples remains in program and project reports, other CSO documents and websites, and more practice-oriented — less academic — development literature, such as books, magazines and papers, which are often not known to the formal ARD world.

It is evident that there is still a big divide between the worlds of "formal" and "informal" ARD, despite the fact that they seek common goals in serving smallholder communities. This divide needs to be bridged in order to support mutual learning and to foster partnerships between actors that would lead to more useful and sustainable outcomes for smallholders.

The CGIAR Research Program on Aquatic Agricultural Systems (AAS) and the international secretariat of PROLINNOVA,[1] a Global Partnership Programme of the Global Forum for Agricultural Research (GFAR), are exploring ways of partnering to bridge this divide. PROLINNOVA is an NGO-led multistakeholder international network that has been engaged in promoting farmer innovation and farmer-led participatory research through multistakeholder partnerships for more than 10 years. The AAS program is a "system CGIAR research program" that is pursuing a more process-oriented ARD that involves embedding research in development processes and, in so doing, strengthening capacities of stakeholders to innovate and adapt. This resonates well with the vision and work of the PROLINNOVA network.

One of the challenges to soliciting wide support for such an approach is providing the evidence that farmer-led participatory research and innovation processes lead to outcomes that are useful for a large number of smallholders and thus make significant impacts in terms of food security and sustainable livelihoods.

The PROLINNOVA International Secretariat wishes to join the AAS program in addressing this challenge by undertaking, as a first step, a desk review to compile evidence from the CSO sector that farmer-led agricultural research and innovation processes can lead to relevant and sustainable outcomes for smallholders in terms of food security, environmental sustainability, economic empowerment, gender equality, equity, etc., as well as enhanced innovative capacity. The review would therefore cover primarily "success stories" with some documentation of outcomes and impacts. However, it would also include cases in which the farmer-led research processes do not seem to have achieved the expected impacts or have led to negative impacts and try to elicit the reasons for such failure as sources of learning. Such a review would be useful to ARD actors — both formal and informal, also beyond the AAS program and PROLINNOVA — in showing what can and cannot be achieved through nonconventional approaches to ARD.

A further challenge of doing such a review is finding an appropriate methodology for impact assessment that would be sufficiently credible for formal ARD stakeholders. The conventional systematic review approach is not likely to capture the evidence on these CSO-initiated informal ARD processes, as these are generally not documented in scientific literature. It is for this reason that we propose a two-step process of review. In the first step, we will use an exploratory approach to discover relevant cases and whatever evidence of impact is available. In the second step, the impacts of a selected number of cases discovered in the first step will be further assessed and documented — possibly by or with external evaluators — in a way that makes the results credible for the formal ARD world, including donors in ARD.

The first step of the review will consist of the following activities:

a. Set up an advisory committee to provide methodological support and quality oversight to the review.
b. Prepare a short call on the type of cases we are seeking: cases of farmer-led research, experimentation or innovation development initiated by farmer groups and organizations or NGOs, preferably with some documentation of impacts.
c. Discover relevant cases by means of a call through e-networks, Web search, contacts with resource persons, and searching for published and gray literature.
d. Compile a long list of such cases, indicating the availability of impact documentation.
e. Make a short list of important cases that appear to have been successful but are without documented evidence, as well as cases that have been unsuccessful, and make a brief summary of each case.
f. Draw up criteria for shortlisting cases for which at least some documented evidence of impact is available, and select 10–15 such cases.
g. Develop a format for desk review of the cases; this will need to be done in an iterative manner to accommodate unexpected elements discovered during the review process.
h. Collect relevant material per case focusing on the documented evidence of impact but augmenting this through interviews via Skype or telephone with key stakeholders or resource persons, especially in cases where intervention ceased several years ago.
i. Drawing from this material, write up the selected cases using the review format.
j. Analyze the documented evidence of impact, looking also at the factors for success and failure of farmer-led research approaches, and assess the strength of the evidence.
k. Draft a synthesis document, including suggestions for the next step in the review, which may include evaluation of a small number of cases identified under both (d) and (f).
l. Arrange peer review of the document.
m. Finalize and disseminate the document, possibly through a workshop together with the AAS program, which may also serve as preparation for the second step.

ANNEX B: CALL FOR CASES

We are looking for cases of participatory agricultural research processes that are driven and co-managed by smallholders, and supported by organizations outside the formal research sector.

PROLINNOVA is an NGO-led international network that has been promoting farmer innovation and farmer-led participatory research through multistakeholder partnerships for more than 10 years. Similar experiences of participatory agricultural research and development (ARD) by and with smallholders are largely in the "informal" ARD sector, with civil society organizations (CSOs) as the main facilitators. To gain wide support for such an approach, a major challenge has been to provide the evidence that farmer-driven participatory research and innovation processes lead to outputs and outcomes useful for a large number of smallholders and thus make significant impacts in terms of food security and sustainable livelihoods. Much of this evidence is hidden in the "informal" ARD realm — in program and project reports, other CSO documents and websites, and more practice-oriented development literature, often not known to the formal world of agricultural research.

Such evidence becomes even more important now that the "formal" ARD sector is seeking ways to make its research more relevant for and accessible to smallholders and is seeking examples and good practice to learn from and practitioners from the "informal" ARD sector to partner with. The PROLINNOVA International Secretariat has joined the CGIAR Research Program on Aquatic Agricultural Systems in making a desk review of such evidence from the CSO sector. We are making an inventory of three categories of farmer-led ARD cases: successful cases with some documented evidence; successful cases with no or minimal documented evidence; and cases that failed.

We are therefore seeking examples of farmer-led ARD which:
- Is or has been driven and co-managed by smallholders and is participatory by design.
- Is or has been facilitated and supported by CSOs: NGOs, farmer organizations, community-based organizations, informal farmer groupings, etc.
- Has some documented evidence of impacts in terms of food security, environmental sustainability, social and economic empowerment, gender equality, equity, etc., as well as enhanced innovative capacity.

Do you have such experience and are you willing to share it with us? Please send us any documents or links to documents that we could use in this study.

Do you know of anyone else who may be able to provide us with such information? If so, please give us a name and contact email address.

Do you have an experience to share but are doubtful of any existing documented evidence? Send us the information you have and we will include it in the inventory and see what we can find.

We are also looking for instances in which a farmer-led approach to ARD failed to deliver the expected impacts, as such cases often provide valuable lessons in going forward. Please send us some basic information on the case and why it was deemed a failure.

Send your responses by **30 November 2013** to the PROLINNOVA International Secretariat:
c/o Ann Waters-Bayer (ann.waters-bayer@etcnl.nl) and Gabriela Quiroga (g.quiroga@etcnl.nl)

ANNEX C: SOURCES USED IN IDENTIFYING POTENTIAL CASES FOR THE DESK STUDY

Organizations and electronic mailing lists contacted

1. Agrecol (Germany, Bolivia, Senegal)
2. AgriCord (network of agri-agencies)
3. Agrinatura (European alliance of universities and research organizations)
4. Arid Lands Information Network, Kenya
5. ASPTA (*Assessoria e Serviços a Projetos em Agricultura Alternativa*), Brazil
6. CELEP (Coalition of European Lobbies for Eastern African Pastoralism)
7. Climate Change, Agriculture and Food Security (CCAFS) Research Program of CGIAR, including the Climate Change and Social Learning (CCSL) Yammer group
8. Community Life Competence/Constellation (Belgium-based international network)
9. CoP-PPLD (Community of Practice for Pro-Poor Livestock Development)
10. CoS–SIS (Convergence of Sciences – Strengthening Innovation Systems)
11. CSO-GARD (Civil Society Organisation Group for Agricultural Research and Development)
12. Diobass network (coordinated by Terres et Vie, Belgium)
13. ELD (group of practitioners in endogenous livestock development)
14. Food First, US
15. Former members of the NGOC (NGO Committee of the CGIAR)
16. GFAR (Global Forum on Agricultural Research), which circulated the call to various networks and farmer organizations
17. GRET, France
18. Groundswell, US
19. ILEIA (Information Centre for Low-External-Input and Sustainable Agriculture)
20. INSARD (Including Smallholders in Agricultural Research and Development)
21. Institute of Development Studies, UK
22. International Institute of Environment and Development, UK
23. International Institute for Rural Reconstruction (IIRR), Philippines
24. JOLISAA–JILAC (Joint Learning in Innovation Systems in African Agriculture), project partners plus the JOLISAA International Learning and Advisory Circle
25. McKnight Foundation-supported Communities of Practice
26. ODI (Overseas Development Institute), UK
27. PAEPARD (Platform for African European Partnership on Agricultural Research for Development)
28. PELUM (Participatory Ecological Land Use Management Association) Regional Desk, Zambia
29. PROFEIS (Promoting Farmer Experimentation and Innovation in the Sahel)
30. Prolinnova (Promoting Local Innovation in ecologically oriented agriculture and natural resource management)
31. Prolinnova Oversight Group (POG)

32. RIMISP (Latin American Center for Rural Development), Chile
33. St Ulrich Group of Practitioners in Participatory Technology Development (PTD)
34. World Farmers Organisation
35. World Neighbors, US
36. WRI (World Resources Institute), US

Publications used for identifying potential cases

Books

1. Alders C, Haverkort B and van Veldhuizen L, eds. 1993. *Linking with Farmers: Networking for Low-External-Input and Sustainable Agriculture*. London: Intermediate Technology Publications/ILEIA.
2. Czech C. 2005. *Participatory Livestock Research: A Guide.* Rugby, UK: ITDG Publishing/Natural Resources Institute/CTA.
3. Gonsalves J, Becker T, Braun A, Campilan D, De Chavez H, Fajber E, Kapiriri M, Rivaca-Caminade J and Vernooy R, eds. 2005. *Participatory Research and Development for Sustainable Agriculture and Natural Resource Management*: *A Sourcebook*. Laguna, Philippines: International Potato Centre Users' Perspectives with Agricultural Research and Development (CIP-UPWARD); Ottawa: IDRC.
4. Haverkort B, van der Kamp J and Waters-Bayer A, eds. 1991. *Joining Farmers' Experiments: Experiences in Participatory Technology Development*. London: Intermediate Technology Publications/ILEIA.
5. Kolff A, van Veldhuizen L, Wettasinha C, Akhtaruzzaman AFM and Nayeemul Karim M, eds. 2005. *Farmer-Centred Innovation Development: Experiences and Challenges from South East Asia*. Berne: Intercooperation/SDC.
6. Reij C and Waters-Bayer A, eds. 2001. *Farmer Innovation in Africa: A Source of Inspiration for Agricultural Development*. London: Earthscan.
7. Sanginga PC, Waters-Bayer A, Karia S, Njuki J and Wettasinha C, eds. 2009. *Innovation Africa: Enriching Farmers' Livelihoods*. London: Earthscan.
8. Scoones I and Thompson J, eds. 2009. *Farmer First Revisited: Innovation for Agricultural Research and Development*. Rugby, UK: Practical Action Publishing.
9. van Veldhuizen L, Waters-Bayer A, Ramírez R, Johnson DA and Thompson J, eds. 1997. *Farmers Research in Practice: Lessons from the Field*. London: Intermediate Technology Publications/ ILEIA.
10. Wettasinha C and Waters-Bayer A, eds. 2010. *Farmer-Led Joint Research: Experiences of Prolinnova Partners*. Silang, Philippines: IIRR; Leusden, The Netherlands: Prolinnova International Secretariat, ETC EcoCulture.
11. Wettasinha C, van Veldhuizen L and Waters-Bayer A, eds. 2003. *Advancing Participatory Technology Development: Case Studies on Integration into Agricultural Research, Extension and Education*. Silang, Philippines: IIRR/ETC/CTA.

Magazines

1. *BeraterInnen News/Rural Development News* (Switzerland)
2. *ILEIA Newsletter/LEISA Magazine/Farming Matters* (Netherlands)

ANNEX D: INDIVIDUALS WHO PROVIDED FURTHER INFORMATION ABOUT THE CASES[2]

1. Agossou Affo Bindé, *Centre d'Action pour la Sécurité Alimentaire, le Développement Durable et la Valorisation des Ressources* (CASADD-VR), Togo
2. Anja Martineit, Misereor, Germany
3. Assétou Kanouté, ADAF-Gallè, Burkina Faso
4. Chris Reij, World Resources Institute, US
5. Daniel Rodriguez, Practical Action, Peru
6. Djibril Thiam, Agrecol-Afrique, Senegal
7. Djibrilou Koura, Diobass, Burkina Faso
8. Ejigu Jonfa, FAO, Ethiopia
9. Elisabeth Katz, independent, Kyrgyzstan
10. Eric Holt-Giménez, Food First Institute for Food and Development Policy, US
11. Furgassa Bedada, Farm Africa, Ethiopia
12. Hamado Sawadogo, INERA, Burkina Faso
13. Hans Schaltenbrand, School for Agricultural, Forest and Food Sciences (HAFL), Switzerland
14. Henri Hocdé, CIRAD, France
15. Hugues Dupriez, Terres et Vie, Belgium
16. Jean-Marie Diop, independent, Belgium
17. Jonathan Hellin, International Maize and Wheat Improvement Center (CIMMYT), Mexico
18. Jürgen Hagmann, Institute for People, Innovation and Change in Organisations (PICOTEAM), South Africa
19. Kerealem Ejigu, Apiculture Scaling-up Programme for Income and Rural Employment (ASPIRE), Ethiopia
20. Kudakwashe Murwira, GIZ, Zimbabwe
21. Lydia Kasonia, *Syndicat pour la Défense des Intérêts des Paysans* (SYDIP), Democratic Republic of the Congo
22. Mans Lanting, independent, The Netherlands
23. Maria Omonte, World Neighbors, Bolivia
24. Michelle Winthrop, Farm Africa, Ethiopia
25. Mwita Mchuni, Farm Africa, Tanzania
26. Nguyen Lam Giang, Helvetas Swiss Intercooperation, Vietnam
27. Paolo Ficarelli, Bill and Melinda Gates Foundation, US
28. Peter Gubbels, Groundswell International, Ghana
29. Peter Schmidt, Helvetas Swiss Intercooperation, Switzerland
30. Peter Weston, World Vision, Australia
31. Philippe de Leener, Catholic University of Louvain, Belgium
32. Roland Bunch, independent, Kenya

33. Sally Humphries, University of Guelph, Canada
34. Steffen Schulz, International Potato Center (CIP), Ethiopia
35. Sylvain Mapatano, Diobass, Democratic Republic of the Congo
36. Tom Macmillan, Soil Association, UK
37. Tony Rinaudo, World Vision, Australia
38. Tran Van Tri, Helvetas Swiss Intercooperation, Vietnam
39. Ueli Scheuermeier, Rural African Ventures Investments (RAVInvest), Switzerland
40. Yohannes GebreMichael, University of Addis Ababa, Ethiopia

ANNEX E: ALL CASES SCANNED FOR DESK STUDY

No.	Case name	Country	Organization	Source
1	Institutionalization of farmer study groups (workshop report, several cases)	Eastern and southern Africa	Several	Web search
2	Local Innovation Support Funds (LISFs) – eight cases	Africa and Asia (eight countries)	Multistakeholder platforms coordinated by NGOs	PROLINNOVA
3	Adaptive networks for floodplain management	Bangladesh	Flood Hazard Research Centre	Innovation Asia–Pacific Symposium
4	Agricultural research and development	Bangladesh	BRAC	Julian Gonsalves
5	Beekeeper-led development process	Bangladesh	Bangladesh Institute of Apiculture	Misereor
6	Farmers lead the way in sustainable agriculture	Bangladesh	Caritas Bangladesh	Misereor
7	Local seed innovation systems	Bangladesh	Rural Development Academy	Innovation Asia–Pacific Symposium
8	Impacts of farmer field schools (FFSs) on vegetable crop producers	Benin	International Institute for Tropical Agriculture (IITA), Norwegian Institute for Agricultural and Environmental Research	Response to call
9	Participatory technology development (PTD) in Convergence of Sciences – Strengthening Innovation Systems (CoS–SIS)	Benin, Ghana (four cases)	Universities with NGOs	Niels Röling
10	Agroforestry demonstration farm	Bolivia	Private initiative	Response to call
11	Farmer-led experimentation	Bolivia	World Neighbors	ILEIA book
12	Participatory transfer of technology	Bolivia	Private initiative (research report)	Response to call
13	Proposal on climate change adaptation by smallholder farmers	Bolivia	Agrecol–Andes	Response to call
14	Farmer-led experimentation in Paraíba	Brazil	*Agricultura Familiar e Agroecologia* (AS-PTA)	ILEIA book
15	Farmer's own innovation development and spread	Burkina Faso	Informal farmer group	ISWC program

16	Smallholder action research (*recherche action paysanne*)	Burkina Faso	Diobass, Terres et Vie	Hugues Dupriez
17	Community management of crop diversity	Burkina Faso, Ghana, Mali, Niger	McKnight Foundation	Response to call
18	Farmer-led experimentation with system of rice intensification (SRI)	Cambodia	PROLINNOVA–Cambodia, CEDAC	PROLINNOVA
19	Participatory technology development (PTD) in soil and water management	Cameroon	ISWC program	Jean Marie Diop
20	Smallholder Innovation for Resilience (SIFOR)	China, India, Kenya	IIED	Own network
21	Farmer-led research to find high-yielding potato varieties	DRC	SYDIP	Response to call
22	Farmer research brigades	DRC	Diobass, Actions pour le Développement Integré au Kivu (ADI-Kivu)	Sylvain Mapatano
23	Increasing sweetpotato and bean production through farmer experimentation	DRC	*Action pour le Développement Économique et Agricole* (APRODEA)	Response to call
24	Farmer experimentation upscaled	Costa Rica	*Mesa Nacional Campesina* (National Farmers Board)	ILEIA book
25	Farmer-led documentation	Ethiopia	PROLINNOVA–Ethiopia, Mekelle University	Response to call
26	Farmer-led research supported by Local Innovation Support Fund (LISF) – Case 1	Ethiopia	PROLINNOVA–Ethiopia, Ethiopia Rural Self-Help Association (ERSHA)	PROLINNOVA
27	Farmer-led research supported by Local Innovation Support Fund (LISF) – Case 2	Ethiopia	PROLINNOVA–Ethiopia, Institute for Sustainable Development (ISD)	PROLINNOVA
28	Participatory innovation development (PID) on enset bacterial wilt	Ethiopia	PROLINNOVA–Ethiopia, ASE	PROLINNOVA
29	Participatory innovation development (PID) on beehives	Ethiopia	PROLINNOVA–Ethiopia, ASE	PROLINNOVA
30	Institutionalisation of Farmer Participatory Research (IFPR) project	Ethiopia	FARM–Africa	FARM–Africa
31	Farmers' own experimentation	France	*Les Centres d'Initiatives pour Valoriser l'Agriculture et le Milieu rural* (CIVAM)	Henri Hocdé

32	Participatory innovation development (PID) and low-external-input and sustainable agriculture (LEISA) in northern Ghana (two cases)	Ghana	PROLINNOVA–Ghana North, Association of Church Development Projects (ACDEP)	PROLINNOVA
33	Local agricultural research committees (CIALs)	Honduras	FIPAH, after started by CIAT	Sally Humphries
34	Farmer-experimenters	Honduras (after Guatemala)	World Neighbors	ILEIA book
35	Honeybee: grassroots innovations	India	Honeybee network	*ILEIA Newsletter*
36	Land-to-lab approach	India	Peermade Development Society	Innovation Asia–Pacific Symposium
37	Participatory technology development (PTD) innovation platforms in Orissa	India	Intercooperation	Mans Lanting
38	Participatory technology development (PTD) innovation platforms through NGOs in Kerala (three cases)	India	Intercooperation	Mans Lanting
39	Participatory technology development (PTD) innovation platforms with international research (two cases)	India	AME	Mans Lanting
40	Participatory technology development (PTD) in ginger in Sikkim	India	Intercooperation	Mans Lanting
41	Participatory technology development (PTD) in supplementary feedstuffs for goats	India	BAIF Development Research Foundation	Czech Conroy
42	Revitalizing a traditional cassava variety	India	Peermade Development Society	Response to call
43	Shri Kshethra Dharmasthala Rural Development Project	India	National Institute of Rural Development	Response to call
44	System of rice intensification (SRI) and learning alliances	India	Several NGOs	Shambu Prasad
45	Watershed management and self-help groups	India	Myrada	Julian Gonsalves
46	Farmer research through farmer field schools (FFSs)	Indonesia	Farmer Initiatives for Ecological Literacy and Democracy (FIELD)	Web search
47	Farmer access to web-based information about pest management	Kenya	Arid Lands Information Network (ALIN)	Response to call
48	Farmer Voice Radio	Kenya	Kilimo Media	Response to call

49	Participatory validation of medicinal plants for livestock	Kenya	ITDG (now Practical Action)	Czech Conroy
50	Request for funds to work with farmers	Kenya	Faith-based organization	Response to call
51	Kyrgyz Swiss Agricultural Project	Kyrgyzstan	Helvetas	ILEIA book
52	Agroecological revolution in Latin America	Latin America	Numerous CSOs	Stephen Sherwood
53	Community-based experimentation and extension	Mali	World Neighbors	Peter Gubbels
54	Participatory innovation development (PID) in Mali	Mali	ADAF-Gallè	PROLINNOVA
55	Small seed drill suitable for family farmers	Mali, Morocco	Farmer organizations	AgriCord
56	Cardamom and ginger value chains	Nepal	Mercy Corps	Innovation Asia–Pacific Symposium
57	Participatory technology development (PTD) and farmer-led extension for sustainable soil management	Nepal	30 NGOs	ILEIA book
58	Community-oriented breeding	Nepal	PROLINNOVA–Nepal, LI-BIRD	PROLINNOVA
59	Innovative approach to produce biogas from water hyacinth (PTD)	Nepal	Ecoscentre (Ecological Services Centre)	Innovation Asia–Pacific Symposium
60	*Programa Campesino a Campesino,* later *Movimiento Campesino a Campesino*	Nicaragua, Central America	UNAG	*ILEIA Newsletter*
61	Farmer-led innovation in regreening the Sahel	Niger	SahelEco	Peter Gubbels
62	Joint experimentation on fish smoking	Niger	PROLINNOVA–Niger, *Centre Régional d'Enseignement Spécialisé en Agriculture* (CRESA)	PROLINNOVA
63	Local institutional innovation in relation to gender	Nigeria	Ara Traditional Council	Web search
64	Innovations in management of fruit flies in mango orchards	Pakistan	CABI	Innovation Asia–Pacific Symposium
65	*Kamayoq* farmer-to-farmer extension combined with farmer experimentation	Peru	ITDG (now Practical Action)	Julian Gonsalves
66	MASIPAG	Philippines	MASIPAG	ILEIA book
67	School gardening program	Philippines	IIRR	Julian Gonsalves
68	Common village meals – a social innovation	Senegal	Agrecol-Afrique	Response to call
69	Farmer innovation in direct sowing of rice	Senegal	Agrecol-Afrique	Response to call

70	Farmer experimentation in pest management in mango production	Senegal	Agrecol-Afrique	Response to call
71	Farmer innovation in papaya production	Senegal	Agrecol-Afrique	Response to call
72	Farmer innovation in tree grafting	Senegal	Agrecol-Afrique	Response to call
73	Farmer innovation to protect valley from salinization	Senegal	Agrecol-Afrique	Response to call
74	Farmers' agroecological experiments (four cases)	Senegal	Agrecol-Afrique	Response to call
75	Innovation vouchers	Several	Several	Giel Ton
76	Empowering smallholders in markets: experiences with farmer-led research for advocacy (publication with nine country cases)	Several	Several	Web search
77	Participatory technology development (PTD) and low-external-input and sustainable agriculture (LEISA) work among small-scale farmers	Solomon Islands	Melanesian Farmer First Network	Tony Janssen
78	Cross-visits to stimulate farmer-led experimentation	South Africa	PROLINNOVA–South Africa, Church Agricultural Project (CAP)	PROLINNOVA
79	Knowledge-based innovative rice farming systems	Sri Lanka	Future in Our Hands	Innovation Asia–Pacific Symposium
80	Promoting Multifunctional Household Environments (PMHE)	Sri Lanka	ETC Foundation	Chesha Wettasinha
81	Research on farmer-developed variety of pearl millet	Sudan	Practical Action	PROLINNOVA
82	Interactive participatory technology development (PTD) process on donkey plow	Sudan	Oxfam-UK and ITDG (now Practical Action)	ILEIA book
83	Farmer-led experimentation in maize pit farming	Tanzania	Multistakeholder platform	ISWC program
84	Farmer-led innovation development	Tanzania	PROLINNOVA–Tanzania, INADES	PROLINNOVA
85	Farmer participatory research (FPR) in Tanzania	Tanzania	FARM–Africa	FARM–Africa
86	On-farm integrated pest management trials with weevil traps	Tanzania	Norwegian Institute for Agricultural and Environmental Research	Response to call
87	Small farmers making innovations	Tanzania	Kimakiki Farmers' Group	AgriCord
88	Farmer research on producing and processing green peppers	Togo	CASADD–VR	Response to call

89	Building institutions for endogenous development	Uganda	Lutheran World Federation	Innovation Africa Symposium
90	Community-led action learning for gender justice in coffee chains	Uganda	Oxfam	Web search
91	Enhancing Rural Innovation	Uganda	Started with CIAT but later NGOs	Thomas Pircher
92	Farmer innovation and experimentation in land management	Uganda	ISWC, Promoting Farmer Innovation (PFI)	Will Critchley
93	Youth for Life	Uganda	Youth for Life	Response to call
94	Field labs	UK	Soil Association	Response to call
95	Participatory technology development (PTD) as an approach to extension	Vietnam	Helvetas	ILEIA book
96	Farmer-managed natural regeneration	West Africa	Serving in Mission, World Vision	Peter Gubbels
97	Participatory plant breeding for community-based on-farm conservation	Zambia	Zambian Agriculture Research Institute	Response to call
98	Developmental work research	Zimbabwe	Multistakeholder platform including local NGOs and farmer organizations	Response to call
99	Kuturaya participatory extension approach	Zimbabwe	ITDG (now Practical Action)	ISWC program

* Some entries refer to several cases (2–9) — e.g., discussed in a workshop or reviewed in another study — or to different activities by the same NGO. The (sub)cases are not listed separately in this table. The total number of (sub)cases considered was about 130.

ANNEX F: LONG LIST OF 41 CASES FOR DESK STUDY[3]

No.	Name of case and short description	Name of CSO	Type of CSO: farmer organization, community-based organization, NGO, informal farmer group, etc.
1	**Local Innovation Support Funds (LISFs)**: Systematic review. Hypothesis 1: Grants to facilitate farmer-driven experimentation open up neglected research areas in agricultural production and enhance applicability of results. Studies on LISFs refer to benefits of interactive relationship between farmers and technicians or researchers but no counterfactual evidence about what other research areas would or would not have been opened up without the funds. Impact studies provide weak support but hypothesis considered valid; moderate supporting evidence. Hypothesis 2: Participation of local farmer organizations in deciding about research funds is effective in directing or redirecting research to critical constraints in on-farm innovation, particularly to needs of poor and women. Farmers' participation in governance structure indeed defined activities supported by grants in ways that made them more in line with farmers' priorities; strong supporting evidence. Hypothesis 3: Participation of higher-level farmer organizations in deciding about research grant funds is effective in scaling on-farm innovation processes up and out. Progressive involvement of higher-level farmer organizations in up- and outscaling innovation grant activities but farmer organizations are result of scaling process, whereas NGOs are more important as drivers of it; weak supporting evidence (Ton et al. 2013).	Prolinnova (multistakeholder network initiated by CSOs)	National multistakeholder platforms coordinated by NGOs
2	**Participatory technology development (PTD) in Convergence of Sciences – Strengthening Innovation Systems (CoS–SIS)**: Inter-university collaborative research program focused on PTD five years later; evaluation of seven cases of experimentation by and with farmers revealed that African smallholders face very small windows of opportunity and gain minimal benefits from improved technologies at farm level. Most innovations that required support at higher levels did not survive (Huis et al. 2007). Sterk et al. (2013) found much evidence of continued benefits of technologies developed with farmers and lasting nontechnological effects: more mutual understanding among community members, emancipation vis-à-vis researchers and colleagues, and experimental attitude and research skills. Four cases suggested by Niels Röling: i) palm-oil processing by women in Ghana; ii) experiments by cotton farmers in Benin; iii) experiments by rice farmers in inland valleys in Benin; iv) local innovation in goat marketing in Ghana.	CoS-SIS	Universities; some international and national NGOs involved in some cases

	Country or region	Years covered (CSO intervention/ known since)	Strength of evidence of impact (strong, medium, weak)	Sources of documented evidence at time of making short list in Annex G
	Africa and Asia	2006–2012	Medium to weak	Ton et al. 2013. *Effectiveness of Innovation Grants to Smallholder Agricultural Producers: An Explorative Systematic Review*. London: EPPI-Centre, Social Science Research Unit, Institute of Education, University of London. Prolinnova. 2012. *Farmer Access to Innovation Resources: Findings and Lessons Learnt on Facilitating Local Innovation Support Funds*. Leusden, The Netherlands: Prolinnova International Secretariat, ETC Foundation.
	Benin, Ghana	2002–2006 (PTD phase), 2008–2013 (Strengthening Innovation Systems phase)	Likely to be strong (documented by doctoral and postdoctoral students; could be useful example to provide evidence of low impact)	Several articles, but key ones on impact not freely accessible. Huis et al. 2007. *Research researched: ...International Journal of Agricultural Sustainability* 5(2&3):89–264. Sterk et al. 2013. Five years after: The impact of a PTD programme as perceived by smallholder farmers in Benin and Ghana. *Journal of Agricultural Education and Extension* 19(4):361–79. Osei-Amponsah C. 2013. Improving the quality of crude palm oil: Transdisciplinary research on artisanal processing in Kwaebibirem District, Ghana. [PhD thesis] University of Wageningen. Three other PhD theses sent by Niel Röling.

3	**Farmer-led experimentation**: World Neighbors in Bolivia trained farmers in the design and management of systematic experiments, including developing some capacity to carry out basic statistical interpretation of results. Documentation accessed so far shows that farmer-experimenters achieved increased yields but does not indicate to what extent the new ways of doing things spread beyond this initial group of farmers.	World Neighbors	International NGO
4	**Farmer-led experimentation in Paraíba**: Having started with a few on-farm trials, the Project Paraíba coordinated by *Agricultura Familiar e Agroecologia* (AS-PTA) in partnership with local farmer organizations gradually made farmer-led experimentation a central component of its approach. It evolved from working with individual reference farmers to working with experimenting interest groups and later locally based experimenting groups. The role of farmers became increasingly important over the years. In 2000, in one project zone alone, covering seven communities or *sito*, 42 farmer families were doing experiments on 13 different issues.	AS-PTA	National NGO
5	**Farmer's own innovation development and spread**: A well-known farmer innovator in Burkina Faso is described as the source of the famous *zaï* pit planting system widely acknowledged to be an effective approach to bring highly degraded land back into crop production. Through his linking with other innnovators who, in turn, used various sharing and extension approaches of their own, the *zaï* technology has spread widely in Burkina Faso and beyond. Other research and development stakeholders played a facilitating role in providing, e.g., a motorcycle or travel funds for the innovators to help scale up the technology.	Ousséni Zoromé (farmer innovator)	Informal farmer group
6	**Smallholder action research *(recherche action paysanne)***: One of two examples of the Diobass approach (see also No. 8). Smallholder action research involves animal health and nutrition; natural resource management, especially water management; soil fertility management; pest and disease management; and agricultural marketing. According to 2012 report, with support from Misereor and Broederlijk Delen, smallholder action research has been further expanded, and 23 innovations developed by about 60 action-research groups of smallholder farmers have spread to 32,551 farmers through 38 farmer organizations involving about 100 community-based organizations.	Diobass; Terres et Vie	National and international NGOs, community-based organizations, farmer organizations

	Bolivia	1989–1995	Weak	Some impact notes in Ruddell E. 1997. Empowering farmers to conduct experiments. *In* van Veldhuizen L, Waters-Bayer A, Ramirez R, Johnson DA and Thompson J, eds. *Farmers' Research in Practice: Lessons from the Field*. London: Intermediate Technology Publications. 199–208.
	Brazil	1997–2000	Weak	Case details without impact data in Sabourin E, Sidersky P and Marçal da Silveira L. 2003. Supporting agricultural innovation in Northeast Brazil: The approach of Projeto Paraíba. *In* Wettasinha C, van Veldhuizen L and Waters-Bayer A, eds. *Advancing Participatory Technology Development*. Silang, Philippines: IIRR. 177–96. Programa Paraíba (http://aspta.org.br/programas/programa-paraiba).
	Burkina Faso	1992–1999 (initial development and spread), 2001–2006 (continued PTD in German bilateral PATECORE project)	Medium	Ouedraogo A and Sawadogo H. 2000. Three models of extension by farmer innovators in Burkina Faso. *LEISA Magazine* 16(2):21–22. Sawadogo et al. 2008. Évaluation des impacts physiques et socioéconomiques des investissements dans les actions de gestion des ressources naturelles au nord du Plateau Centrale du Burkina Faso. PATECORE project final report.
	Burkina Faso	1990–present	Strong	Diobass. 2013. Rapport d'activités année 2012. Nivelles, Belgium: Diobass Écologie et Société. Paulus I. 2013. Recherche-action paysanne: Rapport de synthèse de trois évaluations au Burkina Faso, au Mali et au Sénégal. Aachen, Germany: Misereor. Paulus I and Mongbo R. 2012. *Diobass–Burkina Evaluation Report*. Aachen, Germany: Misereor.

7	**Farmer-led experimentation with system of rice intensification (SRI)**: In Cambodia, the Cambodian Centre for Study and Development in Agriculture (CEDAC) has introduced and upscaled SRI to more than 100,000 small-scale farmers who report significant economic and ecological benefits. CEDAC, as the lead NGO of Prolinnova–Cambodia, has been promoting local innovation and farmer-led joint research. According to CEDAC, one of the reasons for the successful spread of SRI is the fact that farmers were given the freedom to conduct experiments on aspects of the methodology — spacing of seedlings, regimes of watering, etc. — to adapt it to their own conditions.	CEDAC	National NGO coordinating Prolinnova–Cambodia multistakeholder platform
8	**Farmer research brigades**: In eastern Democratic Republic of the Congo, where formal agricultural research and development is weak, farmers organized their own research, with support from the NGO ADI-Kivu. The farmers formed *brigades paysannes* to serve the community by doing locally relevant agricultural research and sharing results via village-level workshops, fairs and exchange visits, using 3D models as communication tools. Some information available from 1997 about impacts on development programming, social organization, and change in attitudes of farmers and technical advisors. In 1999, *groupes de recherche-action* of young people were formed; a group focusing on urban agriculture was formed in 2001. This is all part of the *Plate-formes Diobass Écologie et Société* initiative supported by the Belgian NGO Terres et Vie. The 2012 annual report gives some information on outcomes (see also No. 6: Smallholder action research approach in Burkina Faso, likewise Diobass).	Diobass; Action for Rural Development in Kivu (ADI-Kivu)	National NGO together with international NGO
9	**Farmer-led research to find high-yielding potato varieties**: Farmers trained as local potato-seed multipliers were able to select good varieties; impacts reported in terms of better food security (higher yields per unit area, slightly higher prices for selected varieties than others, higher household income), environment (selected varieties more resistant to diseases and pests, therefore less use of chemicals expected; because higher yields, farmers less likely to try to cultivate in protected areas) and gender (tried to include women but these find varietal selection process very time-consuming; therefore, few women are involved). Joint research now being started in farmers' fields and seed multiplication center with aim to facilitate access to low-cost seed of selected high-performance varieties.	SYDIP; supported by Agriterra	Local smallholder farmer organization and international agri-agency

	Cambodia	2000–present	Weak	Oral reports of system of rice intensification (SRI) introduced through farmer experimentation but mentioned only in passing in English reports. Written documentation mainly in Khmer; no documentation on experimentation process.
	Democratic Republic the of Congo	1988–present	Medium to weak	Impact areas reviewed by Mapatano Mulume S. 1997. Strengthening community capacity for sustainable agriculture. *In* van Veldhuizen L, Waters-Bayer A, Ramirez R, Johnson DA and Thompson J, eds. *Farmers' Research in Practice: Lessons from the Field*. London: Intermediate Technology Publications. 139-52. Diobass. 2013. Rapport d'activités année 2012. Nivelles, Belgium: Diobass Écologie et Société.
	Democratic Republic of the Congo	1996 (as independent farmer organization), potato research since 2004	Weak (little reported about farmer-led research approach; will be difficult to relate approach to impact)	Syndicat de Défense des Intérêts Paysans. 2013. Expérience du SYDIP dans la recherche et développement agricole. Butembo, DRC: SYDIP.

10	**Farmer experimentation upscaled**: Building on years of experience with farmer-experimentation approaches such as through the *Campesino a Campesino* movement and the Regional Program for Reinforcing Agronomic Research of Basic Grains in Central America, farmer organizations in the Huerta North Region of Costa Rica joined hands with NGOs and the Ministry of Agriculture to form the Regional Committee of Farmer Experimenters in the Northern Zone. Impact of the approach on institutions involved is documented. It will be necessary to identify among all the farmer-led experiments done under this umbrella some specific cases with evidence of impact on farmers' livelihoods and spread of results of experiments.	National Farmers Board; UPANACIONAL (farmer organization promoting "Rural University")	Farmer organizations working with many other agencies and research
11	**Farmer-led research supported by Local Innovation Support Fund (LISF) – Case 1**: In the Ambo area of Oromia Region, farmer Jifara Workineh experimented with different ways to break seed dormancy of *Podocarpus* tree, valued for good timber. Received grant from LISF to experiment with three germination techniques; achieved 85 percent germination rate and reduced dormancy period from over 12 months to three weeks; received award from Ethiopian Government; Jifara encouraged and taught other farmers including youth groups to start growing *Podocarpus* on marginal land to produce timber; in 2011, collaboration with researcher from Addis Ababa University was planned on soil types for *Podocarpus* (no documentation of what happened). The Sustainable Land Management project in Ethiopia, funded by GIZ, contracted Jifara to produce seedlings of *Podocarpus* to be planted in communal enclosures. Today, selling seedlings has become a source of income for Jifara.	Prolinnova–Ethiopia; AgriService Ethiopia (ASE) and Ethiopian Rural Self-Help Association (ERSHA)	National NGO coordinating Prolinnova–Ethiopia multistakeholder platform in partnership with member NGO
12	**Farmer-led research supported by Local Innovation Support Fund (LISF) – Case 2**: In the Axum area of Tigray Region, Kes Malede, farmer innovator in water-lifting devices and well-digger, received grant from LISF to improve design of his innovation; about 300 households in Axum area were reportedly using his device or self-adapted version of it by 2008, and 600 wells were dug with his support by 2012 — but unclear about use of water-lifting devices and what impact these have.	Institute of Sustainable Development (ISD); Prolinnova–Ethiopia	National NGO, part of multistakeholder platform

	Costa Rica	1992–2000	Weak	Hocdé H and Meneses D. 2003. The meeting of two worlds: Constructing processes of PTD in northern Costa Rica. *In* Wettasinha C, van Veldhuizen L and Waters-Bayer A, eds. *Advancing Participatory Technology Development*. Silang, Philippines: IIRR. 197–214. Hocdé H, Meneses D and Mirands B. 2000. Farmer experimentation: A challenge to all! *ILEIA Newsletter* 16(2):28–30. Also articles in *Rev. Ciencias Sociales* 2004(IV):106–107; 2005(I):143–63.
	Ethiopia	2007 (farmer innovation), 2008 (LISF)	Weak to medium (evidence of impact in very brief documents available; not clear what happened to PID with university researcher)	Box in World Bank report (Agricultural Innovation Systems Investment Sourcebook, 2012) and in Prolinnova policy brief on Local Innovation Support Funds (2012). Yohannes GM, Hailu A and Tesfahun F. 2012. *Impact Assessment of the FAIR (Farmer Access to Innovation Resources) Piloting in Ethiopia*. Addis Ababa: Prolinnova–Ethiopia.
	Ethiopia	2003 (start of PID based on local innovation), 2007 (start of LISFs)	Medium to weak (source of evidence for spread and impacts of devices not clear)	Hailu A, Tesfahun F and Luel H. 2008. *A Fund to Support Local Innovation: Experience of a Farmer in Tigray*. Addis Ababa: Prolinnova-Ethiopia. Hailu A. 2013. Incredible innovation: From dreaming for water into water-lifting innovations. *In* Hailu A, Yohannes GM and Edwards S, eds. *Some Examples of Best Practices by Smallholder Farmers in Ethiopia*. Addis Ababa: Best Practice Association. 35–43 (but little included about impact). Hailu et al. 2005. Local water-related innovation to reduce labour inputs and achieve food security. *Energia* 8(1).

13	**Participatory innovation development (PID) on enset bacterial wilt**: The NGO AgriService Ethiopia (ASE) discovered how farmers in southern Ethiopia were innovating to control enset bacterial wilt; supported by staff from ASE, the Ministry of Agriculture and Awassa Research Centre, the farmer innovators tested the effectiveness of the local treatments and organized field days and workshops for joint learning by other farmers and development agents. The experience increased the farmers' confidence to interact with formal researchers.	ASE	National NGO coordinating Prolinnova–Ethiopia multistakeholder platform
14	**Participatory innovation development (PID) on beehives**: ASE identified farmer innovation in improving beehives in Amhara Region and linked farmers with Andassa Livestock Research Centre. A researcher and a farmer innovator worked with five other beekeepers in farmer-led experiments with different types of beehives, with one replication on station. A total of 21 bee colonies were used in the experiment. ASE and farmers promoted the locally developed beehive, but its spread has not been documented. Farmers continue to experiment on their own. The researcher recommended modifications but there were no funds for him or others in the research center to continue working with the farmers.	ASE	National NGO coordinating Prolinnova–Ethiopia multistakeholder platform
15	**Institutionalization of Farmer Participatory Research (IFPR) project**: In 1998, evaluation of the Farmers' Research Project initiated by FARM–Africa in South Omo showed the following: i) Farmer participatory research (FPR) helped research and extension respond better to farmers' needs and speeded up generation and dissemination of appropriate technologies; and ii) being part of the FPR process helped farmers develop confidence in identifying complex problems, setting priorities, and testing and evaluating options. The IFPR project was meant to scale up FPR in the Southern Region. Farmer-led participatory on-farm trials served as means of experiential learning and influencing senior officials of agricultural research and development institutions through field visits to the trials. Presentations by farmers at regional multistakeholder fora helped change attitudes of other stakeholders toward farmers' capacities and roles in research and communication. Changes were claimed in research, extension and education institutions.	FARM–Africa	International NGO

	Ethiopia	2003–2008	Weak (not clear what happened after 2008)	Demekech G and Tesfahun F. 2010. Jointly comparing local innovations to combat enset bacterial wilt in Ethiopia. *In* Wettasinha C and Waters-Bayer A, eds. *Farmer-Led Joint Research*. Silang, Philippines: IIRR. 22–27.
	Ethiopia	2009–2010 (as PID)	Weak (not clear what happened after 2010)	Kerealem E, Assemu T, Ashagrie G, Mengist D (farmer innovator) and Seblework T. 2011. Comparison of Aba Mengist beehive with top-bar and frame hives in Enebse Sar Midir and Bahir Dar Zurio Districts. Report to Amhara Regional Agricultural Research Institute.
	Ethiopia	1991–1998 (FPR), 1999–2003 (IFPR)	Medium to strong	FARM–Africa. 2001. *Farmer Participatory Research in Southern Ethiopia: The Experiences of the Farmers' Research Project*. Project Experience Series 1. London: FARM–Africa. Retrieved from www.farmafrica.org/downloads/resources/Farmer%20Participatory%20Research%20in%20Southern%20Ethiopia.pdf Ejigu J and Waters-Bayer A. 2005. *Unlocking Farmers' Potential: Institutionalising Farmer Participatory Research and Extension in Southern Ethiopia*. Project Experience Series 2. London: FARM–Africa. Retrieved from www.prolinnova.net/sites/default/files/documents/resources/publications/2005/ifpr.pdf Opondo C, Bediye S, Tesfaye A, Bedada F, Mazengia W and Ejigu A. 2003. Impact assessment of the project IFPR in SNNPRS, Ethiopia.

16	**Participatory innovation development (PID) and low-external-input and sustainable agriculture (LEISA) in northern Ghana (two cases):** Possible cases: i) Spread and impact of farmer innovation in storage of seed onions (improved shelter, use of local herb); on their own and with some grants through local innovation support fund, 80 farmers have taken up this innovation. ii) Long interactive process of PID on locally produced salt lick until commercial setting up of farmer group.	Prolinnova–Ghana North; Association of Church Development Projects (ACDEP)	National NGO coordinating Prolinnova–Ghana multistakeholder platform
17	**Local agricultural research committees (CIALs)**: This is a methodology developed by the International Center for Tropical Agriculture (CIAT) in Colombia. The CIAL work in Honduras was initiated by CIAT in 1993. After a year, the researcher left CIAT and joined the University of Guelph but continued the work with the CIALs. She joined hands with a group of Honduran researchers (ex-government service) and set up a local NGO called the Foundation for Participatory Research with Honduran Farmers (Spanish acronym FIPAH). Farmers who are members of the CIALs learn how to plan an experiment in response to a local agricultural problem, carry it out, evaluate it and analyze it. Over the years, CIAL members have been involved in breeding their own varieties of beans and maize, which are giving higher yields and are better adapted to the local conditions than conventional varieties. This, in turn, has improved the livelihoods of some of the most marginal communities in Honduras.	FIPAH	National NGO

	Ghana	2008–2011 (LISF), 1999–2009 (PID on saltlick)	Weak	Onions: Farmer Access to Innovation Resources impact report 2010. Mineral lick: Karbo N. 2010. Research to promote local innovation: Siella mineral lick for livestock in Ghana. *In* Wettasinha C and Waters-Bayer A, eds. *Farmer-Led Joint Research*. Silang, Philippines: IIRR. 28–34.
	Honduras	1993–present	Medium	Ashby J. 2000. Investing in farmers as researchers: Experiences with local agricultural research committees in Latin America. Humphries et al. 2008. Sharing in innovation: Reflections on a partnership to improve livelihoods and resource conservation in the Honduran hillsides. Members of ASOHCIAL et al. Campesinos cientificios: Farmer philosophies on participatory research. *In* Fortmann L, ed. *Participatory Research in Conservation and Rural Livelihoods: Doing Science Together.* Wiley and Blackwell. 37–69. Humphries et al. 2012. Opening cracks for the transgression of social boundaries: An evaluation of the gender impacts of farmer research teams in Honduras. *World Development* 40(10):2078–95. Classen et al. 2008. Opening participatory spaces for the most marginal: Learning from collective action in the Honduran hillsides. *World Development* 36(11):2402–20.

18	**Farmer-experimenters**: Starting with World Neighbors' Guinope Integrated Development Program (Jan. 1981, based on experiences in Guatemala 1972–1979), farmer experimentation was introduced into agricultural development in Honduras; about 20 development organizations (NGO and government) taught farmers to experiment in at least 30 programs around the country; hundreds of farmer-experimenters continued to experiment and innovate without further outside support; in 1999, the International Development Research Centre (IDRC) gave the NGO *Asociación de Consejéros para una Agricultura Sostenible, Ecologica y Humana* (COSECHA) a grant to do an impact study; this showed that the 52 farmer-experimenters interviewed developed 82 new technologies in crop farming, postharvest handling and food preparation but dissemination was limited; since programs ended, yields continue to increase (in Guatemala, maize yield increased from 2,400 kilograms per hectare at end of program to 4,500 kilograms per hectare 15 years later, and bean yields increased by 75 percent); led to *Campesino a Campesino* program and movement in Nicaragua (see No. 28).	World Neighbors; Guinope Program with Catholic Relief Services (CRS); Cantarranas Program with CRS and ACORDE	International NGOs with local NGO
19	**Participatory technology development (PTD) innovation platforms through NGOs in Kerala (three cases)**: Through the Indo-Swiss bilateral program in Kerala managed by Intercooperation, a PTD approach was successfully introduced and applied to address key production challenges faced by farmers. Three subcases: a) work on dwarf growth of bananas, facilitated by the NGO Association of Voluntary Agencies for Rural Development; b) work on quick wilt in pepper, with the NGO Rasta, that led to many important insights but failed to generate solutions that could be spread easily; and c) work on virus in cardamon with a local NGO; spread of findings not clear.	Intercooperation with local NGOs, supported by ETC India	International NGO with local NGOs

	Honduras (after Guatemala)	1981–1989 (Guinope Program), 1983–1990 (Cantarranas Program)	Strong	Bunch R. 1982. *Two Ears of Corn: A Guide to People-Centered Agricultural Improvement*. Oklahoma City: World Neighbors. Bunch R. 1990. *Low Input Soil Restoration in Honduras: The Cantarranas Farmer-to-Farmer Extension Programme*. Gatekeeper 23. London: IIED. Retrieved from http://pubs.iied.org/pdfs/6038IIED.pdf Bunch R and López G. 1995. *Soil Recuperation in Central America: Sustaining Innovation after Intervention*. Gatekeeper 55. London: IIED. Retrieved from http://pubs.iied.org/pdfs/6069IIED.pdf Bunch R and Canas M. 2001. Farmer experimenters: The technologies they develop on their own. Paper prepared for Advancing PTD workshop, Philippines. Bunch R. 2001. Enabling long-term impact of soil conservation through farmer-driven extension. Retrieved from http://topsoil.nserl.purdue.edu/nserlweb-old/isco99/pdf/ISCOdisc/SustainingTheGlobalFarm/P058-Bunch.pdf
	India	2002–2007	Weak	Personal communication from Mans Lanting.

20	**Participatory technology development (PTD) innovation platforms with international research (two cases)**: PTD processes on the Deccan Plateau facilitated by the NGO Agriculture, Man, Ecology (AME) and involving local NGOs, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and Australian Centre for International Agricultural Research (ACIAR): a) studied ways to control white grub in peanut fields; results were spreading fast; b) studied ways to control fungus infection in peanut fields, including farmers' use of a simple tool to alert when spraying needed; also addition of magnesium was found to be effective (subcase b without ACIAR).	AME	National NGO
21	**Participatory technology development (PTD) innovation platforms in Orissa**: Through the Indo-Swiss Natural Resource Management program in Orissa managed by Intercooperation, a PTD approach was applied to address key production challenges faced by local farmers. Two subcases: a) PTD to address leaf disease in rice, expanding to include wider cultivation system; the improvements developed led to more than 100 percent increase in rice production and spread rapidly; b) similar process used to address problems in maize that were found to be caused not by termites (as originally thought) but by zinc deficiency; as a result, more than 100,000 farmers are reportedly applying zinc to their maize crops.	Intercooperation with local NGOs, supported by ETC India	International NGO and local NGOs
22	**Farmer research through farmer field schools**: Innovation development and research are not normally part of the farmer field school (FFS) curriculum, apart from the option of making a few standard tests in the FFS. However, within the diversity of FFS development and spread in rice in Indonesia, groups of FFS farmers have undertaken innovation development activities with or without support from other agencies. A report from 2010 discusses the most interesting cases.	Farmer Initiatives for Ecological Literacy and Democracy (FIELD), grew out of FAO integrated pest management (IPM) program	NGO (foundation) reporting on FAO project work

	India	1997–2002	Medium	Naidu YD and van Walsum E. 2003. PTD for sustainable dryland agriculture in South India: Balancing our way to scale. *In* Wettasinha C, van Veldhuizen L and Waters-Bayer A, eds. *Advancing Participatory Technology Development*. Silang, Philippines: IIRR. 215–36. Impact study by ACIAR (Mans Lanting). Impact study of AME by Virendar Katana. AME final report. International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) documentation. Personal communication from Mans Lanting. Naidu YD, Lanting H and Kolli RD. 1998. Leaf wetness counter: A case study of institutional partnership towards sustainable groundnut production in South India. Paper presented at International Workshop on NGO–Research Partnerships, 4–10 October, Silang, IIRR.
	India	2002–2007	Weak	Personal communication from Mans Lanting.
	Indonesia	1990–1999	Weak	van den Berg H, Ooi PAC, Hakim AL, Ariawan H and Cahyana W. 2004. *Farmer Field Research: An Analysis of Experiences from Indonesia.* FAO-EU IPM Programme for Cotton in Asia. Retrieved from www.vegetableipmasia.org/docs/C07-FFR.pdf

23	**Kyrgyz Swiss Agricultural Project**: Supported through Swiss development funding and implemented by Helvetas in 1995–2010, the project sought to establish a demand-driven agricultural extension service steered by farmers in the context of the centrally organized Soviet system transitioning into a market-oriented system. The main thrust of the project was in setting up a rural advisory service and in building the capacity of a cadre of rural advisors. During the pilot phase, PTD was used in stimulating farmers to take up new activities such as cheese production. How PTD was further integrated into the rural advisory service during scaling up is not clear from the documents available. Available report on outcome assessment of the rural advisory service describes the food security, income and livelihood benefits gained by farmers; 70 percent of communes have access to the rural advisory service and 30 percent of all farms have obtained advice from the service.	Helvetas	International NGO with national extension
24	**Community-based experimentation and extension**: World Neighbors developed and used the community-based experimentation and extension approach in its efforts to strengthen the capacity of communities, farmers and their organizations to promote sustainable agriculture, also through its program *Service d'Appui et de Formation pour l'Auto-Devéloppement Rural*. Initially focused on encouraging fairly systematic farmer-led experiments, the approach evolved to include other experimentation and learning activities of farmers to find or test new practices, with a complementary emphasis on strengthening community organizations and institutions.	World Neighbors	International NGO

	Kyrgyzstan	1997–2001 (PTD activities)	Weak	Schmidt P. 1999. Finding new things that work: The Kyrgyz Swiss Agricultural Project introduces PTD. *BeraterInnen News* 2/99:10–12. Joss S and Nadyrbek K. 2003. PTD in the Kyrgyz Republic with special reference to the Rural Advisory and Development Service in Jalal Abad Oblast. *In* Wettasinha C, van Veldhuizen L and Waters-Bayer A, eds. *Advancing PTD*. Silang, Philippines: IIRR. 116–37. Schmidt P. 2001. The scientific world and the farmer's reality: Agricultural research and extension in Kyrgyzstan. Schmidt P. 2010. Voice and choice: Rural advisory services in Kyrgyzstan (learning from 20 years of development cooperation). Retrieved from https://assets.helvetas.ch/downloads/voice_and_choice_rural_advisory_services_in_kyrgyzstan_eng.pdf Our advice is your success: Impact of advisory services on profitability of small farms in Kyrgyzstan. Helvetas report. Retrieved from https://assets.helvetas.ch/downloads/35_ouradviceisyoursuccess_kirgistan_ras_ksap_grau_final_engl_a4_portrait.pdf
	Mali	1986–1995	Medium	Impact study: Gubbels P. 1997. Strengthening community capacity for sustainable agriculture. *In* van Veldhuizen L, Waters-Bayer A, Ramirez R, Johnson DA and Thompson J, eds. *Farmers' Research in Practice: Lessons from the Field*. London: Intermediate Technology Publications. 217–44.

25	**Participatory innovation development (PID) in Mali**: Started under Prolinnova and PROFEIS umbrella with Misereor support, PID on gardening, livestock keeping and organizational innovation; PROFEIS platform aimed at changing research and development institutions but actually focuses mainly on local-level innovation and experimentation with individual farmers and researchers; evaluation sees large potential in approach but not yet realized because not giving focused attention to institutional change. Evaluation report brings no quantitative data about impact.	ADAF-Gallè	National NGO coordinating PROFEIS–Mali multistakeholder platform
26	**Participatory technology development (PTD) and farmer-led extension for sustainable soil management**: Given the lack of appropriate research recommendations for soil management, including those focusing on use of organic matter, the bilateral Sustainable Soil Management Project in Nepal worked with a group of NGOs to facilitate about 360 farmer-led experiments, partly based on farmers' own innovations. About 290 experienced farmers were trained and encouraged to use results of the experiments in training programs, reaching around 30,000 households. A small focused impact study concluded that around 50 percent of people exposed to the sustainable soil management practices used a selection of them.	30 NGOs facilitated the farmer-led experiments	Bilateral project funded by SDC
27	**Community-oriented breeding**: Local Initiatives in Biodiversity, Research and Development (LI-BIRD) has been supporting farmers in participatory plant breeding, now called community-oriented breeding, for many years. Several varieties of rice and wheat bred by farmers have been officially certified and released by the government seed service and are being used widely.	LI-BIRD	National NGO coordinating Prolinnova–Nepal multistakeholder platform

	Mali	1990–present	Medium to strong	Paulus I and Mongbo R. 2012. Évaluation du programme PROFEIS au Mali. Paulus I. 2013. Recherche-action paysanne: Rapport de synthèse de trois évaluations au Burkina Faso, au Mali et au Sénégal. Aachen, Germany: Misereor.
	Nepal	1997–2003 (PTD activities)	Medium	Paudel CH, Regmi BD and Schulz S. 2005. PID: Experiences of the Sustainable Soil Management Programme in Nepal. *In* Kolff A, van Veldhuizen L and Wettasinha C, eds. *Farmer-Centred Innovation Development*; with results of study on spread and adoption after farmer-led experimentation and extension.
	Nepal	1995–present	Weak	Recent documents in Nepali, so difficult to judge; documentation in English refers to work supported by DFID and IDRC in projects led by formal research institutions where LI-BIRD was the NGO partner.

28	***Programa Campesino a Campesino,* later *Movimiento Campesino a Campesino***: Training visits between Mexican and Nicaraguan peasants in 1986–1989 as part of the "promotors' experimentation program"; 55 peasants in 23 communities organized into informal network for training, exchange and experimentation; 40 conducted own experiments in weed control; grew into nationwide movement; hundreds of farmer volunteer extensionists initially supported by two to three extension staff in Managua; high impact with limited budget; cost per farmer who adopted some technology from farmer-experimenters about US $50. Rather than try to convince farmers to accept new technologies, farmer-experimenters encouraged them to experiment with new things on a small scale to see how well they worked; all that was asked in return was that the farmers likewise share their new knowledge with others; by 2006: several thousand farmer-promotors and network of hundreds of NGOs (www.foodfirst.org/backgrounders/campesino).	UNAG with Mexican NGO Service for Development and Peace	Farmer organization and NGO
29	**Joint experimentation on fish smoking**: Prolinnova–Niger partners initiated experiment to improve design of locally developed fish-smoking oven; quantitative data in terms of reduced fuelwood consumption and higher quantity of fish smoked per unit time; other benefits: less smoke pollution, better quality of product, increased demand for the smoked fish, higher incomes, increased interest of local people to experiment and document their achievements, farmer-led experimentation integrated into adult literacy training.	Prolinnova–Niger; Regional Centre for Specialised Education in Agriculture (CRESA)	Multistakeholder platform involving research, extension and NGO

	Nicaragua, Central America (Cuba, Guatemala, Mexico)	1986–1989 (first intervention in Nicaragua), *Movimiento Campesino a Campesino* continues	Strong	Holt-Giménez E. 1992. From peasant to peasant. *ILEIA Newsletter* 8(2):3–4. Holt-Giménez E. 1996. Movimiento Campesino a Campesino: Linking sustainable agriculture and social change. *Food First Backgrounder* 12(1). Oakland, Institute for Food and Development Policy. Holt-Giménez E. 1996. *Campesino a Campesino: Voices from Latin America's Farmer to Farmer Movement for Sustainable Agriculture*. Oakland, CA: Institute for Food and Development Policy. Holt-Giménez E. 2000. Measuring farmers' agroecological resistance to Hurricane Mitch in Central America (Gatekeeper 102). Retrieved from http://dlc.dlib.indiana.edu/dlc/bitstream/handle/10535/6232/MEASURING%20FARMERS'%20AGROECOLOGICAL.pdf?sequence=1 Holt-Giménez E and Crus Mora O. 1993. Farmer to farmer: The Ometepe Project, Nicaragua. *In* Alders C, Haverkort B and van Veldhuizen L, eds. *Linking with Farmers: Networking for Low-External-Input and Sustainable Agriculture*. London: Intermediate Technology Publications. 51–65.
	Niger	2007–2009	Weak (not clear what happened after 2010)	Magagi S, Diop JM, Toudou A, Seini S and Mamane A. 2010. Joint experiment to improve a local fish-smoking oven in Niger. *In* Wettasinha C and Waters-Bayer A, eds. *Farmer-Led Joint Research*. Silang, Philippines: IIRR. 35–43.

30	***Kamayoq* farmer-to-farmer extension combined with farmer experimentation**: Local people given eight months of training, mainly in field, crop and animal husbandry; not only provided technical advice but also did experiments together with other farmers to find local solutions; e.g., treating fungal disease in maize, controlling mildew in onion, treating animal diseases. ITDG developed a method to measure impact; example given of impact of participatory technology development to control sheep liver fluke: 3,000 families benefited in terms of financial, human and social capital through lower animal mortality, higher incomes, more self-esteem and confidence among farmers, and more autonomy for women.	ITDG (now Practical Action) with local government	International NGO
31	**MASIPAG** (English translation: Farmer-Scientist Partnership for Sustainable Agriculture): A partnership of farmers, farmer organizations, scientists and supportive NGOs. Initiated by a small group of farmers who wanted to breed rice varieties that would not need high levels of external inputs and who invited a small group of scientists to support them, MASIPAG has grown into a national movement of people-led development in the Philippines. Empowerment is embedded in all elements of MASIPAG's approach, which include farmer-led research, farmer-to-farmer diffusion, and ongoing learning among farmers, scientists and NGOs. According to recent estimates, nearly 600 farmer ("people's") organizations from 49 districts in the country are members of the network, and 200 farmer trainers and 64 farmer rice breeders are engaged in disseminating and improving farmer-controlled genetic resources. Impacts of MASIPAG's approach are visible at many levels: farm, household, community and national. The approach has inspired and influenced similar initiatives in other countries.	MASIPAG	Partnership of farmer organization, scientists and NGOs

	Peru	1996–1997	Medium to weak (no documents found later than 2006 but case still on Practical Action website)	Hellin J, Rodriguez D and Coello J. 2003. Measuring the livelihood impact of farmer-to-farmer extension services in the Andes. Enterprise Development Impact Assessment Information Service. Retrieved from www.sed.manchester.ac.uk/research/iarc/ediais/pdf/Hellin.pdf Hellin et al. 2005. The Kamayoq in Peru: Combining farmer-to-farmer extension and farmer experimentation. *In* Gonsalves et al., eds. *Participatory Research and Development for Sustainable Agriculture and Natural Resource Management, Vol. 3*. Laguna, Philippines: International Potato Centre Users' Perspectives with Agricultural Research and Development (CIP-UPWARD); Ottawa: IDRC. 153–56. Hellin J, De la Torre C, Rodriguez D and Coello J. 2006. The Kamayoq in Peru: Farmer-to-farmer extension and experimentation. *LEISA Magazine* 22(3):32–34.
	Philippines	1985–present	Medium	Bachmann L, Cruzada E and Wright S. 2009. *Food Security and Farmer Empowerment: A Study of the Impacts of Farmer-Led Sustainable Agriculture in the Philippines*. Los Banos, Philippines: MASIPAG. Downloadable as separate chapters at http://masipag.org/downloads/ Cruzada E. 2010. Sustaining participation and scaling up farmer empowerment. *In* Misereor, ed. *Strengthening People-Led Development*. Retrieved from www.misereor.org/fileadmin/redaktion/MISEREOR_Strengthening_people-led_development.pdf

32	**Promoting Multifunctional Household Environments (PMHE)**: A bilateral cooperation project implemented in an irrigated settlement scheme (System C) in Sri Lanka. In finding a strategy for sustainable agricultural development, ETC promoted a participatory approach that included PTD as a key element. Farmers were stimulated to experiment to find solutions to their farming problems, supported by government extensionists and researchers of the Mahaweli Authority. A systematic capacity-enhancement program ensured that the staff of the government development agency gained the necessary knowledge, skills and attitudes to facilitate such an approach. Nearly 10 years later, when the project was completed, farmer-led experimentation had been institutionalized into the government agency as an integral element of the strategy for sustainable agricultural development and had been scaled up to other areas beyond System C. Farmers had succeeded in building up diversified farming systems that resulted in food security, increased household incomes and better livelihoods.	ETC Foundation; Mahaweli Authority	International NGO and government organization
33	**Interactive participatory technology development (PTD) process on donkey plow**: This case covers 10 years of trial and error led by farmers and blacksmiths. After problems with using introduced camel plows, a prototype donkey plow brought in from the UK became the subject of extensive experimentation by farmers and blacksmiths. Being part of a larger development project allowed mobilization of funds for supportive activities such as capacity building and a form of credit system.	Oxfam–UK and ITDG (now Practical Action)	International NGO
34	**Farmer-led innovation development**: This work started under Promoting Farmer Innovation (PFI) and ISWC projects and was followed up under Prolinnova–Tanzania through the LISF. Key parts of process: i) identifying farmer innovators and innovations; ii) strengthening these through cross-visits, exposure and interaction with various agencies (some formal research); and iii) farmer-led extension, brochures and cross-visits. Impact data in terms of spread to larger number of farmers available for trench cultivation of tomato, alternative fish feeds, soil fertility management, and farmer-developed and marketed Mapambano compost.	INADES	National NGO coordinating Prolinnova–Tanzania multistakeholder platform

	Sri Lanka	1991–2000	Weak	Wettasinha C. 2001. Scaling up participatory development in agricultural settlements. *LEISA Magazine* 17(30):39–42. Perera GD. 2002. Towards sustainable development in Mahaweli settlements through farmer participation. PTD Working Paper 6. Leusden, The Netherlands: ETC. Promoting Multifunctional Household Environments (PMHE) project final report. *Strong Together* (25-minute video on project highlights, mainly the participatory approach to development).
	Sudan	1984–1994	Medium to weak	Suliman MS. 2005. Development of the Kebkabiya donkey plough in Western Sudan. *In* Conroy C, ed. *Participatory Livestock Research: A Guide*. Warwickshire, UK: ITDG Publishing. 247–56.
	Tanzania	1997–2011	Medium	Malley ZJU. 2011. Impact assessment of Prolinnova and FAIR (Farmer Access to Innovation Resources) activities in Tanzania, PELUM Tanzania, Morogoro.

35	**Farmer-led experimentation in maize pit farming**: Researchers from Agricultural Research Institute Uyole supported farmers who pursued their own questions about growing maize in pits compared to row sowing. By 1999, a quick survey showed that 91 farmers had adopted or adapted this innovation (but earlier literature suggests that this was indigenous knowledge, not a recent local innovation).	ISWC led by Cooperative College Moshi, with Mviwata (national small-scale farmer organization); INADES, etc.	Multistakeholder platform including national NGOs and farmer organization
36	**Farmer participatory research (FPR) in Tanzania**: Working with rural communities in northern Tanzania, FARM–Africa learned from project-initiated on-farm trials in the 1990s and applied a farmer-led approach to research from 2000 onwards. This included forming farmer research groups, electing leaders in these groups, planning research work (including selecting technologies for testing and related capacity building), and designing and implementing farmer-led on-farm trials, including exchange between groups and farmer-to-farmer dissemination and information sharing.	FARM–Africa	International NGO
37	**Farmer research on producing and processing green peppers**: Part of the *Consortium pour la Chaine de Valeur du Piment en Afrique de l'Ouest* (Pepper Value Chain Consortium in West Africa) stimulated by Platform for African-European Partnership on Agricultural Research for Development (PAEPARD); in 2008 started action research on improving quality of red pepper powder; 2009 on combating diseases of red and green peppers and on inventorying and characterizing red pepper cultivar; 2011 on characterizing two red pepper cultivars with view to marketing and semi-industrial processing.	CASADD-VR	NGO working with International Fertilizer Development Center (IFDC)
38	**Field labs**: An initiative of the UK Soil Association similar to FFS approach. Each field lab is hosted by a producer who has identified a problem and tries to find a solution through a trial, either on his or her own or with the help of researchers. Several other farmers interested in the issue join the lab and meet two to four times during the trial to share lessons and compare notes. Launched in 2012, the initiative is still in its early stages, but an internal evaluation made after Year 1 indicates that most farmers involved in the field labs are very motivated and have been stimulated to do trials on their own. They also appreciate the very practical approach that takes account of farmers' needs and knowledge.	Soil Association	National NGO

	Tanzania	1997–2000	Medium to weak	Malley Z, Temu A, Kinabu Nmwigune S and Mwageni A. 2001. Sowing maize in pits: Farmer innovation in southern Tanzania. *In* Reij C and Waters-Bayer A, eds. *Farmer Innovation in Africa: A Source of Inspiration for Agicultural Development*. 267–77. London: Earthscan.
	Tanzania	2000–2007, building on 10 years of on-farm experimentation	Medium to strong	Ewbank R, Kasindei A, Kimaro F and Slaa S. 2009. Farmer participatory research in northern Tanzania: FARM-Africa's experience. *In* Scoones I and Thompson J, eds. *Farmer First Revisited: Innovation for Agricultural Research and Development*. 211–19. Rugby: Practical Action Publishing. Ewbank et al. 2007. FPR in northern Tanzania. FARM–Africa Working Paper 11. Impact assessment by Tsamas and Qameyu. Ejigu J. 2005. Impact assessment study of FPR.
	Togo	NGO since 2002, research and development consortium since 2011 (PAEPARD)	Weak (not clear how action research was done and what the role of farmers was in on-farm trials)	CASADD–VR. 2013. Présentation du système de recherche guidé par les utilisateurs.
	UK	2012–present	Weak (too early)	Dutchy Originals Future Farming Programme, Monitoring Report – Year 1, August 2013.

39	**Participatory technology development (PTD) as an approach to extension**: Farmer experimentation to develop locally adapted technologies, initially in Social Forestry Support Programme (1994–2002), later Extension and Training Support Project for Forestry and Agriculture in the Uplands (2003–2007); evaluation survey showed that attitude of extension workers to farmers changed from top-down technology transfer to learning together; they recognized that farmers have much local knowledge and experience from which they can learn; Hoa Binh Province adopted PTD as official extension method; farmers and extensionists gained practical experience with new technologies and, together with data monitoring of experiments, it became easy to share results of successful experiments to other farmers and communities; PTD incorporated in curriculum of National Agriculture Extension Centre and Vietnam Forestry University through participatory curriculum development but, after end of project, lecturers found it difficult to apply approach. Except in Hoa Binh Province, extension officers stopped applying PTD because no budget available and because PTD had not been officially introduced as extension method.	Helvetas	International NGO
40	**Farmer-managed natural regeneration**: Involves the systematic regeneration and management of trees from tree stumps, roots and seeds. The technique was introduced to a few farmers in the Maradi Region of Niger in 1983 through a project of Serving in Mission, a Christian development organization; 20 years later, the impacts of farmer-managed natural regeneration in Niger are significant. Five million hectares of land have been reforested, providing a range of social, economic and environmental benefits to local communities. Farmers who learn the natural-regeneration technique have the freedom to choose which trees they regenerate, where they do it and how. The approach has been supported and promoted by World Vision Australia in Ethiopia, Ghana, Senegal and many other countries with success in terms of upscaling and positive livelihood impacts. Farmer-to-farmer exchange is considered one of the reasons for the fast and successful spread of the practice.	Serving in Mission; World Vision	International NGO

	Vietnam	1999–2007 (support to PTD)	Medium (institutional change in limited area, little quantitative data about impact)	Schulz C. 2000. Initiating PTD: Experiences with two different procedures in northern Vietnam. *BeraterInnen News* 2/2000:23–27. Cai HH, Felber R and Hung V. 2003. PTD in community-based forestland management to build up a farmer-led extension system in Vietnam. *In Advancing PTD*. Silang, Philippines: IIRR. 157–76. Schaltenbrand H and Luong PV. 2007. Forestry and agriculture extension in Vietnam: Five years of experiences of the Extension and Training Support Project for Forestry and Agriculture in the Uplands, ETSP, 2003–07. Retrieved from https://assets.helvetas.ch/downloads/en_etsp_achievements_final_oct.pdf Boi DD, Thanh HX, Phuong NK and Yen NTK. 2007. Social Forestry Support Program (SFSP) 1994-2002: Impact analysis five years after the end of the phase. Retrieved from www.socialforestry.org.vn/Document/DocumentEn/SFSP%20impact%20analysis%20final.pdf Taylor P. 2005. Participatory curriculum development and learner-centered education in Vietnam. *In* Gonsalves J et al., eds. *Participatory Research and Development in Sustainable Agriculture and Natural Resource Management, Vol. 2*. Laguna, Philippines: International Potato Centre Users' Perspectives with Agricultural Research and Development (CIP-UPWARD); Ottawa: IDRC. 5–13.
	West Africa	1983–present	Medium (but more on technology than approach)	Five documents sent by Peter Gubbels and Chris Reij in 2012. More information sent in Dec. 2013 by Tony Rinaudo (World Vision Australia), who seems to have been the person who initiated this in 1983 in Niger; part of current EverGreen Agriculture initiative (World Agroforestry Centre and World Vision Australia) in West Africa.

41	**Kuturaya participatory extension approach**: Developed and widely applied in a partnership of an NGO (ITDG), a university in Zimbabwe and the Zimbabwean Ministry of Agriculture and its extension service Agritex through a bilateral project with the German Agency for Technical Cooperation (GTZ). It integrates key components and principles of PTD and the Training for Transformation approach, well-known in southern Africa. According to Schmidt et al. (1998), besides new technologies developed, there was important farmer organizational impact: 89–90 percent of all households in the project area became members of farmer clubs; established regular contacts with research and extension services (activities only in two of the 183 wards in Masvingo Province, one of nine provinces in Zimbabwe; however, triggered institutional change in Agritex). A reform of the extension service in Limpopo Province of South Africa (likewise a GTZ project) was inspired by these experiences in Zimbabwe.	ITDG (now Practical Action)	International NGO in collaboration with bilateral project

	Zimbabwe	1991–1995 (first phase Kuturaya)	Medium	Hagmann J, Chuma E and Murwira K. 1997. Kuturaya: Participatory research, innovation and extension. *In* van Veldhuizen L, Waters-Bayer A, Ramírez R, Johnson DA and Thompson J, eds. *Farmers' Research in Practice: Lessons from the Field*. London: Intermediate Technology Publications. 153–73. Schmidt P, Etienne C and Hürlimann M. 1998. *Participatory Extension: Insights from Three Agricultural Development Projects in Africa*. Lindau: Landwirtschaftliche Beratungszentrale Lindau (LBL); one of the projects is this project. Other Hagmann writings. Project reports.

ANNEX G: SHORT LIST OF 13 POTENTIAL CASE STUDIES

No.	Name of approach	Country or region	Main research focus	Lead organization and partners in implementation
1	Farmers developing and disseminating *zaï*	Burkina Faso	Soil and water conservation	Farmer innovators and their groups
2	*Campesino a Campesino*	Central America	Soil improvement	National farmer organization with NGO
3	MASIPAG (Farmer-Scientist Partnership for Agricultural Development) to promote farmer-led sustainable agriculture	Philippines	Seed improvement	Farmers with scientists and NGOs
4	Farmer-experimenters	Honduras (after Guatemala)	Crops	International NGO, local NGOs and government organizations
5	Farmer participatory research	Tanzania	Crops	International NGO with government extension staff
6	Smallholder action research	Burkina Faso	Variety of topics	International NGO with local NGOs, community-based organizations and farmer organizations
7	Participatory innovation development	Mali	Variety of topics	National NGO coordinating PROFEIS–Mali platform with other NGOs, community-based organizations and government institutions
8	Local agricultural research committees (CIALs)	Honduras	Seed improvement	National NGO with links to formal research
9	Kuturaya participatory extension approach	Zimbabwe	Soil and water conservation	International NGO with local NGOs, university and government extension agency
10	Participatory technology development as an approach to extension	Vietnam	Forestry	International NGO with government extension and education institutions in donor-funded bilateral project
11	Institutionalizing farmer participatory research	Southern Ethiopia	Crops	International NGO with government research, extension and education institutions
12	Participatory technology development (PTD) and farmer-led extension	Nepal	Soil management	International NGO with local NGOs in donor-funded bilateral project
13	Farmer-led innovation development	Tanzania	Soil and water conservation	National NGO coordinating PROLINNOVA–Tanzania with NGOs and government institutions

ANNEX H: FORMAT FOR CASE STUDIES

Introduction
This desk review on the impact of farmer[4]-led approaches to agricultural research and development supported by CSOs — encompassing both nongovernmental organizations and farmer organizations — and other actors outside formal research organizations is based on a series of case studies identified from among a long list of possible cases. These cases were selected according to, among other things, the availability of documentation with some evidence of impact. This note suggests the format for writing up the shortlisted case studies so as to ensure that they cover the relevant areas for the review and to allow some comparison across the cases.

The format is partly open-ended in the sense that it provides an initial overall framework, while allowing the addition of new specific issues of interest under the main headings if and when such issues emerge from the case studies.

Each case study should have a length of about six pages, with about two pages devoted to the description of the approach and its context and about four pages devoted to a review of the impact evidence.

Case description (about two pages)[5]
This section will give the readers a clear insight into the case and the way the farmer-led research process took shape. It will cover the following:

Basic parameters. Lead organization or organizations; type of organization; time period of the intervention or of the start of the intervention, if continuing into the present; country and geographical coverage of the case; indication of scale of operation, including number of farmers or groups and professional staff; annual budgets and source of funding.

Institutional setup and arrangements. Other organizations or groups involved and their context or interest in farmer-led research; roles of actors; mechanisms for collaboration.

Theory of change. What the intervention set out to achieve and its — at least implicit — theory of change, and how this may have changed along the way.

The farmer-led research approach, methodology and process. Description of the key steps, methods and tools used, as practiced — not only as designed.

Links or integration of farmer-led research with other development efforts of the organizations involved. Overview of main other activities implemented in addition to farmer-led research, and their relative importance in supporting acceptance and spread of farmer-led research approach and results.

Wider context. Key factors in the context — political, socio-economic, socio-organizational — that influenced the work and its impact.[6]

Impact review (about four pages)
In compiling and reviewing evidence of impact, the following levels will be distinguished:

Findings from the farmer-led research. Though, in a strict sense, this is probably at the level of outcomes and results, it is important to document to what extent the farmer-led research process did lead to important findings and lessons, both on the topics of the investigation or experimentation process — technologies, socio-organizational innovations, etc. — and on the farmer-led research process and methodology. Did the process lead to substantial findings or learning? Have these been well documented? Have they been spread widely — and by whom, reaching whom?

Impact on farmers' livelihoods. This will include improvements in food security, income generation and natural resource management. This analysis will cover two levels: a) livelihood impact for the farmers directly involved in the farmer-led research activities; and b) the wider spread of documented improvements: How many farm households are using the results of the process and have thus improved their livelihoods?

Where available in the documents consulted, gender-related information and data analysis will be included, cutting across all of the above. In a similar way, equity and social sustainability concerns will also be included.

Enhanced local capacity to innovate. An important impact area beyond direct livelihood improvements following the innovations developed under farmer-led research is the capacity of farmers — individually, through groups or community-based organizations, or through their wider communities — to continue innovating to address other challenges. Increased local capacity to innovate includes, among other things, individual growth in confidence, knowledge and skills to handle experimentation and innovation, more and better links to support organizations or other sources of relevant information, organizational development around experimentation and strengthening of farmer groups and multistakeholder groups involving farmers, creation of local space for experimentation and learning, and increased involvement of women and youth in innovation development efforts.

Also, is there evidence that this increased capacity at the local level has led in practice to improved processes of farmer-led innovation development, strengthened development, or spread or selection and uptake of agricultural innovations by smallholders?

Impact on formal and informal agricultural research and development organizations, including CSOs. Is there evidence that one or more of the organizations involved have integrated or strengthened the integration of the farmer-led research approach into their regular operations? Following existing frameworks for studying institutionalization of farmer-led research, we distinguish between changes in administration, planning and budgeting, in the structure and working mechanisms of the organization, and in the human resources; that is, the staff members and their capacities.

Summary of lessons learned
This final section in the documentation of each case summarizes important lessons that provide further insights into the extent that the case has led to impact, as well as reasons for successes and failures.

Sources of information and data
Given the nature of this desk study, a systematic presentation of sources of information and evidence is crucial. Six types of sources are being distinguished. These are listed below in order of strength of the source for presenting evidence, with (A) being the least strong and (F) being the strongest.

A) Oral communications with persons directly involved.
B) Oral communications with external resource persons.
C) Project's or CSO's own documents.
D) External evaluation report.
E) External publication, written by persons directly involved.
F) External publication, written by others.

Where possible, additional information on these sources of evidence will be given in order to indicate the relative strength of the evidence.

ANNEX I: CASE STUDIES

Case 1: Farmers developing and disseminating *zaï* in Burkina Faso

Introduction

The development and spread of *zaï*, an improved traditional planting pit, originate from the work of innovating farmers in the Yatenga Province of Burkina Faso in the early 1980s. Best known among them are two key farmer innovators, Yacouba Sawadogo and Ousséni Zoromé, and the farmer associations they formed for disseminating the *zaï* technique. Over the years, they interacted with a wide range of development organizations, including NGOs, bilateral projects and research programs, and received support from some of them. In particular, the German-funded development project *Projet Aménagement des Terroirs et Conservation des Ressources dans le Plateau Central* (PATECORE) or "Project for Land Management and Resource Conservation on the Central Plateau," which operated in Burkina Faso from 1988 to 2006, helped to promote *zaï*. It is impossible to give any reasonable estimate of funds invested in these various initiatives, but some of the documents consulted indicate that the role of external funding was small compared to the commitment, time and other resources invested by the farmers involved. Impact data used in this case cover the period from the early 1980s up to 2003.

Theory of change. Given that this is a process almost entirely initiated and led by farmers, there was no planned intervention strategy or overall theory of change designed in advance. The "theory of change" that emerges from what happened in practice is that certain innovations, initiated and developed by farmers and proven effective locally, can spread to many other farmers and be adapted by them with limited but focused support from development and research organizations, eventually leading to important livelihood improvements for farmers and their communities.

Approach and process

In the early 1980s, farmers in Burkina Faso faced increased poverty and severe environmental and land degradation. This was caused by a combination of factors, including increasing population density, recurrent droughts, and an extension and development-support system that failed to provide feasible solutions (see also the farmer narration in the video "The man who stopped the desert"). Several farmers responded to this crisis by experimenting with and improving the traditional small planting pits for wider use to rehabilitate degraded lands.[7] Their main improvements were in increasing the size of the pits and putting manure into them. The latter proved important not only for adding nutrients to the soil but also for attracting termites that helped break down the hard soils.

Seeing the positive results of *zaï*, several of the innovating farmers, including Sawadogo and Zoromé, took the initiative to share their experiences with other farmers. They trained fellow farmers not just within their own villages but also in other villages in the area. To this end, Sawadogo and a few other farmers formed an Association for the Promotion of *Zaï*. A major activity of the association was the organization of "*zaï* markets" twice a year, before and after the main growing season. During these markets, people from as many as 100 villages would not only share how they used *zaï* and for what crops, but also exchange seeds and discuss ways of using *zaï* pits for new crops or trees. Zoromé initiated "*zaï* schools," in which groups of farmers jointly learned to rehabilitate a plot of degraded land by getting hands-on practice in the *zaï* technique under his guidance. By 2000, his district association of "*zaï* schools" had about 1,000 members (Ouedraogo and Sawadogo 2000). Both these initiatives received some funding support, mostly from NGOs.

When the results of the improved *zaï* became increasingly visible, numerous NGOs, projects and government departments arranged and funded visits of farmer groups to the villages of the key innovators. These visits provided an opportunity for other farmers to learn from the innovators and to be inspired by what they were doing. On returning to their communities, these farmers

shared what they had learned with others and started to adopt or adapt *zaï* to their local context. All reports suggest that the farmer-to-farmer learning made possible through these organized visits has been the main factor contributing to the widespread use of *zaï* in Burkina Faso and neighboring countries. In Burkina Faso, the peak of the development and spread of *zaï* was probably reached at the end of the 1980s (C. Reij, personal communication, 2014). But further development, promotion and dissemination in other countries was continued by farmers as well as development projects such as PATECORE for two more decades (PATECORE 2005). The development and spread of *zaï* in Niger took place mostly in the 1990s and was facilitated by the soil and water conservation project in Illela District funded by the International Fund for Agricultural Development (IFAD; Hassane et al. 2000).

While the original innovators continued to experiment and look for new ways to make or use *zaï*, the spread of the *zaï* technique led to numerous adaptations by other farmers, often to fit local conditions and interests. The adaptations included pit size (depending, for example, on soil type and rainfall patterns); use of manure, compost or mineral fertilizers; type of crops grown in the pits; ways of arranging the pits on the land; and density of pits per hectare. In some cases, farmers even planted seeds on the excavated mounds rather than in the pits themselves, when they found the soils were too shallow for the purpose (C. Reij, personal communication, 2014).

The role of research. Formal research did not play a role in the development of the *zaï* innovation or in its initial spread. It was only in the late 1980s and early 1990s that formal research started to take a serious interest in *zaï*, inspired by its rapid spread and encouraged by international programs such as the Indigenous Soil and Water Conservation (ISWC) program coordinated by the VU University Amsterdam in the Netherlands. A series of research papers and reports[8] presented the results of various studies and systematic comparisons and analyses of *zaï* with alternative cultivation practices. Such studies continue in various forms to the present day.[9] These studies provide more insights into the extent to which *zaï* outperforms other systems and explain the reasons and conditions for these results. This, in turn, has created the evidence needed to convince donors and decision-makers to make room for and to fund new agricultural development programs that build on *zaï* or similar farmer-developed soil and water conservation methods and techniques (C. Reij, personal communication, 2014).

Some of the literature refers to the need and possibilities for research to further improve the *zaï* technique developed by farmers in order to address at least two key challenges: high labor requirements for preparing the *zaï* pits and difficulties in obtaining and processing organic materials for fertility management (Sawadogo 2006; 2011). Several efforts have been made by formal research as well as by some farmer groups in Oubritenga in central Burkina Faso to reduce labor requirements by developing a tractor-mounted tool for digging the pits, but there is no documented evidence that this has led to a practical solution that is being used more widely.

Impact

The study-cum-literature-review coordinated by Kaboré and Reij (2004), covering the period from the end of the 1980s to 2003, including all data available in that period, has been the major source of impact information. Other sources referred to are indicated separately in the text.

Findings from the farmer-led research

Innovative farmers were so convinced of the benefits of using *zaï* after observing the results of their own experimental work that they invested considerable time and effort in training other farmers how to use the technique. Its subsequent rapid spread is evidence in itself of the superior performance of *zaï* in comparison with other cultivation systems on degraded soils.

A more systematic assessment of the impact of *zaï* on yields faces considerable methodological challenges, not least due to variability in rainfall from year to year. Studies in Niger showed that cereal yields increased to an average of 388 kilograms per hectare in pitted fields using manure in the pits compared to untreated fields, which yielded an average of 125 kilograms per hectare over

a six-year period. With an additional dose of inorganic fertilizer in combination with the manure in the pits, average yields in treated fields increased to 640 kilograms per hectare. The extra gains made by adding inorganic fertilizer proved highest in years of good rainfall; in other years, the additional yield was not even sufficient to cover the costs of the inorganic fertilizer.

Similar trials over two seasons in Mali indicated that *zaï* pits with manure increased sorghum yields to an average of 719 kilograms per hectare. In Burkina Faso, *zaï* was also found to outperform alternative cultivation practices with 100 percent yield increases, as reported in studies by the *Institut de l'Environnement et de Recherches Agricoles* (INERA) or "Institute for Environmental and Agricultural Research" (Sawadogo 2006; Belemviré et al. 2008). The studies also identified several key reasons for *zaï* success, including harvesting of rainwater, improved infiltration and increased soil fertility. Several documents mention the two above-mentioned challenges farmers face in using *zaï*: labor intensity in preparing the pits and scarcity of organic matter for making compost. Compiling data from several sources, Kaboré and Reij (2004) made a microeconomic analysis of *zaï* planted with sorghum and cowpeas and found that the return to labor is approximately US$ 1.15 per day compared to estimates of shadow wage rates of about US$ 0.85 per day. In reality, the benefits could be higher, if long-term benefits of *zaï* would also be taken into account.

The performance of crop farming using *zaï* in comparison to alternatives has thus been documented extensively. Programs such as ISWC played a role in creating space for researchers in Burkina Faso to work on farmer innovation. Links with NGOs led to the documentation of *zaï* in the form of simple booklets, while farmers have "documented" and spread the message by word of mouth.

Impact on farmers' livelihoods

During an impact assessment of soil and water conservation, agroforestry, and crop intensification in five villages in the northern part of the Central Plateau, farmers agreed unanimously that soil and water conservation, and *zaï* in particular, had a positive impact on household food security (Reij and Waters-Bayer 2001). In years of good rainfall, many farmers produce a small surplus of grain, which provides a buffer for years of low rainfall. A similar picture emerged in Niger, where farm families using soil and water conservation measures produced an estimated surplus of 70 percent in years of good rainfall, while they had an estimated deficit of 28 percent in years with low rainfall (Hassane et al. 2000).

Research reviewed by Kaboré and Reij (2004) and studies by Sawadogo (2006) confirm a gradual buildup of soil fertility on the land of farmers using *zaï*, measured in terms of percentages of organic matter and nitrogen, and pH values. Kaboré and Reij also indicate other impacts of the use and spread of *zaï*: increased tree-growing when farmers selectively maintained trees that grew out of seeds brought into the pits through the manure; increased investments in livestock because more cash and more fodder from straw became available; and increased groundwater levels in open wells, reducing drudgery for women in fetching water. While this analysis is supported by well-documented cases, it is not clear from the documents whether and to what extent these changes are occurring in all or most *zaï* areas.

Though there is widespread agreement in the publications that information about *zaï* has spread far beyond the villages of the initial innovators — itself probably the most significant indication of its impact — land coverage with *zaï* is difficult to estimate. This is partly because considerable portions of land rehabilitated with *zaï* become "normal" land after a few years and are cultivated using other means. Farmers dig *zaï* in the first year, and, after two to five years, they dig new pits between the existing ones. In this way, the entire field is rehabilitated and can be tilled again with a plow or hoe. Farmers rehabilitating gravelly and shallow lateritic soils known as *zegdga* maintain *zaï* on a quasi-permanent basis so that the pits remain visible. Fieldwork during the Kaboré and Reij study revealed that thousands of farmers in and outside Yatenga were using *zaï* in 2001, particularly to reclaim barren degraded land and sometimes also to improve soil quality on their current cropland; tens of thousands of hectares of land in the northern part of the Central Plateau had been treated with *zaï* by that time. Belemviré et al. (2008) report that, in Burkina Faso alone, 300,000 hectares of land had been improved by soil and water conservation practices, mainly stone bunds and *zaï*.

There was also an impressive spread of *zaï* in the Illela District in Niger after an IFAD-funded visit by 13 Nigerien farmers to Burkina Faso in 1989. Three years later, in 1992, farmers in Niger were buying highly degraded land for rehabilitation using *zaï*. In 1993, a survey by the project covering all 3,558 households in 27 of the 77 project villages found that the use of *zaï* had spread in four years to approximately 1,700 households (46 percent of all households), implying a spread in all project villages to more than 10,000 households (Hassane et al. 2000). The spread of *zaï* to neighboring districts was also reported, but not quantified.

In principle, any farmer — rich or poor — can easily master the improved *zaï* technique. Yet, Kaboré and Reij (2004) indicate that the medium-income and better-off farmers seem to use *zaï* more than the very poor, simply because the former have more family labor or have the means to hire labor. Poor families are more likely to benefit from project-supported construction of stone bunds, which is usually done by groups of farmers on blocks of land selected for this purpose. Such blocks of land include fields of smallholder farmers as well as fields cultivated by women. A survey in Niger in 1998 that interviewed 51 women having their own fields found that 32 of them had applied *zaï* in their fields, but noted the need to pay more attention to the impact of soil and water conservation on women (Hassane et al. 2000).

Enhanced local capacity to innovate
None of the reports discuss this issue in any detail. Personal communication with a researcher from the VU University Amsterdam who has followed the developments of *zaï* in Burkina Faso since the early 1980s confirms that at least the two key farmer innovators — Sawadogo and Zoromé — have increased their capacities to interact with development and research organizations and have forged important links and established networks with these organizations (C. Reij, personal communication, 2014).

Impact on formal and informal research and development organizations
The work of the farmer innovators in Yatenga inspired many professionals working in agriculture and natural resource management to understand the potential of farmer innovations in soil and water conservation as compared to larger-scale, more top-down interventions. Many publications on participatory approaches to agricultural research and development feature their stories prominently.[10] Influencing wider research and development organizations and programs in Burkina Faso to recognize farmer-led approaches has not been the direct focus of the innovators' work. It is only through their links to programs such as ISWC in Burkina Faso that they contributed to efforts to influence research and development organizations, though neither of the two key farmer innovators were active members of the farmer innovators' networks established through the ISWC program.

Summary of lessons learned
Farmer-initiated soil and water conservation innovations can be scaled out widely, almost exclusively through farmer-to-farmer extension — especially cross-visits of farmer groups to successful farmer innovators — assuming the innovation itself is attractive and matches realities and conditions of larger groups of farmers. This, in itself, is a major indication of impact.

Farmer innovation does not necessarily generate innovations feasible for the very poor. This can be an issue when innovating farmers have a relatively better economic position. Civil society organizations (CSOs) supporting farmer-led innovation and experimentation should keep this in mind in their interventions, especially those that intend to involve the more marginalized segments of rural communities.

Though the role of formal research has been limited in the development of this particular innovation, the analysis of the case suggests a number of possible roles for formal research organizations in supporting an innovation process that is led and driven by farmers. This could include providing funds to help farmers to train other farmers, organizing and funding visits of farmer groups to innovating farmers, creating linkages for farmer innovators with other actors, and conducting studies to validate and understand farmer-developed innovations so as to increase the credibility of the approach in the eyes of formal research and development managers and donors.

To work in such a participatory mode, formal research and development actors need to have the basic orientation and capacity to recognize and value farmer innovation. This would help them in setting priorities for providing support to the farmer innovations that appear most promising to the farming communities and support organizations. Such priority setting would depend on participatory methods.

Sources of information and data

Personal communication with external resource persons

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Case 2: *Campesino a Campesino* in Central America

Introduction

The *Campesino a Campesino* program, which operated during 1986–1989, was started by the Nicaraguan National Farmers and Cattle Ranchers Union, known in Spanish as the *Unión Nacional de Agricultores y Ganaderos* (UNAG), with support from the Nicaraguan government and the Ford Foundation (World Neighbors 2000). The first step consisted of training visits between Mexican and Nicaraguan smallholder farmers as part of a strategy to build up a network of farmer-experimenters in Nicaragua. Staff and farmers associated with the Mexican NGO Service for Development and Peace (SEDEPAC) had been trained in 1978–1979 by Guatemalan farmers under the San Martin Jilotepeque project funded by the American NGO World Neighbors.[11] UNAG organized 55 Nicaraguan farmers in 23 communities in Rio San Juan into an informal network to be trained by SEDEPAC staff and subsequently to experiment, exchange and disseminate appropriate agricultural technologies for smallholders. Forty of these farmers started to carry out their own small-scale experiments. This group of volunteers that were interested in experimenting and sharing with others became a strong team of *campesino promotores* or farmer-promoters. Over the next few years — through direct farmer-to-farmer contact, through UNAG and with support from local NGOs — this approach spread to nearly all parts of Nicaragua. The *Campesino a Campesino* program grew into a nationwide farmer movement. Until the mid-1990s, two to three *Campesino a Campesino* agronomists based in the capital, Managua, supported hundreds of volunteer farmer-promoters throughout the country. Regional offices were then set up around the country, and the number of supporting agronomists was increased, but the basically village-run, voluntary nature of the program was maintained (Holt-Giménez and Crus Mora 1993).

Over the years, through informal links between groups of *campesinos* and with NGO support, the *Campesino a Campesino* movement spread into new areas and strengthened its presence in farming communities. NGOs provided transportation and funds for farmer-to-farmer visits and workshops, advised on local experimentation, and facilitated access to new information, seed and technology, and, in some cases, credit and access to organic and international markets (Holt-Giménez 2001). By 2006, several hundred thousand farmer-promoters and a network of hundreds of NGOs in Central America were involved in this work (Holt-Giménez 2008).

Funds for the initial work in Guatemala came from World Neighbors and Oxfam; funds for the work in Mexico came from the Mexican Friends Service Committee and later its offshoot SEDEPAC; funds for the work in Cuba came from German-based *Brot für die Welt*. The Ometepe Agroecological Project of UNAG in Nicaragua was financed by Belgian NGO Coopibo. According to Holt-Giménez (2008), the program had a high impact with a small budget. The cost per farmer who adopted some technology from the volunteer extensionists was about US$ 50.

Wider context. After the Nicaraguan Revolution, the *campesinos* could organize themselves freely on a large scale and could arrange their own forms of training, technology generation and sharing. Previously, they had been organized into credit and service cooperatives and worked land titled under the Sandinista land-reform program. They were members of the national farmers' union UNAG, which provided technical support and facilitated provision of credit by the Ministry of Agriculture. When agricultural credit was privatized, the cooperatives stopped applying for credit and were not very active as cooperatives, but the *campesinos* had experience in organizing themselves for collective action; this favored the *Campesino a Campesino* movement. However, the *campesinos'* experience in Guatemala clearly showed the "development dilemma." The more successful the farmer-led research and development projects were, without corresponding changes in the agrarian structure of the country, the more the project participants risked brutal reactions from the rural oligarchies (Holt-Giménez 2008). This was the reason why the *campesinos* who worked with World Neighbors had to flee Guatemala and continue their work with *campesinos* in other Central American countries.

Theory of change. "The best way of generating and transferring appropriate technological options is through small-scale, farmer-led experimentation and direct exchange of knowledge between *campesinos* from different countries, regions, villages and farms" (Holt-Giménez and Crus Mora 1993). The *Campesino a Campesino* approach is based on peasant farmers' determination to develop and support the development of others in a fair and sustainable way, to develop their own agriculture, and to provide decent incomes that come from mutual respect and self-determination (Holt-Giménez 2008).

Approach and process

The basic principle behind *Campesino a Campesino* is described by Bunch (1982) as a people-centered approach to agricultural improvement: encourage small-scale experiments by farmers with a few simple technologies that show rapid and recognizable results and develop a multiplier effect. The farmer-promoters learned how to carry out small-scale individual and group experiments and how to train their peers — farmer-to-farmer. They were given short practical courses in experimentation techniques and promising technologies, such as trying out mucuna (*Mucuna pruriens*) to see if it could control weeds and improve soil fertility. They did the experiments on their own farms. Supported by local NGOs, the promoters held field days and workshops that were attended by other farmers in the community and arranged cross-visits between villages. Sharing also took place through soil conservation fairs. Instead of trying to convince farmers to accept new technologies, the promoters encouraged them to experiment with new things on a small scale to see how well they worked. In return, the experimenting farmers were expected to share their new knowledge with others.

The farmer-promoters trained not only other farmers; they also trained agricultural technicians and advisors from rural NGOs in the *Campesino a Campesino* methodology. Organization of the training was supported by the local custom of providing mutual labor to each other's farms. The farmer-promoters were paid twice a local farmworker's daily wage — one wage for the promoter to give the training and the wage for someone to work on his farm that day. The selection of farmer-promoters was through a "natural" process: those farmers who took part regularly in training events, who keenly tried out new things, who were open to share with others, and who exhibited a natural capacity to teach others (Holt-Giménez and Crus Mora 1993).

As an example of the *Campesino a Campesino* approach, the process in the Ometepe Agroecological Project in the period 1992–1993 was described by Holt-Giménez and Crus Mora (1993) as follows:[12] The project was designed to improve technologies for soil and water conservation, soil fertility, pest and weed control, and reforestation in poor *campesino* communities. It started with a Farmer-Led Experimentation Program, in which 26 local farmer-promoters selected by project staff were contacted through the local UNAG chapter and the local Roman Catholic Church. Almost all the farmers were members of cooperatives and had previously taken part in UNAG or church credit or marketing projects. They identified factors limiting production through problem analysis; they formulated hypotheses; and they designed and implemented experiments to test possible solutions, including ideas that came from indigenous knowledge. The farmer-promoters compared results with their traditional methods, and often experimented with more than one option at a time. They learned about the importance of controlling variables: only changing one thing while leaving others the same. They used plot sizes that allowed easy quantification and comparison with other areas and methods, such as person-days for specific tasks and yields per hectare. The project provided seed free of charge for species, such as mucuna, to be tried out. The farmer-promoters recorded their own observations and measurements in notebooks. Seventeen "formal" experiments were thus carried out in eight communities; another five farmer-promoters did informal trials without controls or written records. Together with project staff, these farmers evaluated their findings in technical, methodological and organizational terms. They then communicated the results to other farmers, assisted by UNAG and NGOs, who linked them with other *campesino* groups. A project staff member also used the *testimonio* or storytelling method supported by basic experimental data to write articles on the research results for the project's monthly newsletter.

In the reports from the early 1990s, only male farmer-experimenters are mentioned; there is nothing about issues of women, gender or equity, as if all farmers were the same. In 1996, the farmer-promoters included only men, but there is mention, with no further specification, of "entire families" being involved in learning about sustainable agriculture; this suggests that women in the families might also have been included. However, in his book on the *Campesino a Campesino* movement, Holt-Giménez (2008) dedicates a whole section to gender and mentions that, at the beginning, women's involvement was limited to gardening and nutrition. During the process of building up and spreading the *Campesino a Campesino* approach, more focused efforts were made — not specified in the available documentation — to enable equal participation by women and men. However, except for some statements from women farmers, there is no further reflection in the documents on a gender perspective in the sustainable agriculture and innovation processes.

There were strong links between the *Campesino a Campesino* work and other activities of the CSOs involved. After the training in soil and water conservation techniques, small-scale experimentation, and adult-learning techniques, the national farmer organizations encouraged local-level farmer organizations around experimentation and advocacy. The supporting NGOs gave training in cooperative administration, product processing and business to help the farmers develop new ways of marketing (Holt-Giménez 2008). Formal research seems to have played a minimal role.

Impact

Findings from the farmer-led research

The experimenting *campesinos* in Rio San Juan, Nicaragua, found that mucuna suppressed growth of the grass weed *Imperata cylindrica*. Farmers came up with different suggestions for managing mucuna in different areas, and shared these ideas through weekly 10-minute radio broadcasts made by UNAG *Campesino a Campesino* staff, based on their interviews with farmer-promoters (Holt-Giménez 1992). The *campesinos* in Ometepe found that the new technologies — cover crops — reduced costs, labor inputs or risks and increased productivity in most cases. The local experiments led to lively discussion between farmers about reasons for differences in results obtained by different farmers and allowed the farmers to reach conclusions on the appropriateness of new technologies for specific farming conditions (Holt-Giménez and Crus Mora 1993).

In Nicaragua, UNAG was the main organizational vehicle for nationwide grassroots communication. Supported by rural NGOs, it arranged visits by farmers to the farmer-experimenters and promoters to learn directly from them. It organized rallies and other meetings where farmer-to-farmer dissemination of findings could take place more or less spontaneously. In the Ometepe *Campesino a Campesino* project, UNAG organized a national symposium of farmer-experimenters, where they shared their results (Holt-Giménez and Crus Mora 1993).

In Cuba, to which the *Campesino a Campesino* movement spread in the mid-1990s, the National Association of Small-Scale Farmers, known by the acronym ANAP, was the driving force behind the dissemination of results. It not only spread the findings of farmers' research but also promoted the *Campesino a Campesino* approach of farmers' experimentation and farmer-promoters through rural radio and publications, which was possible because Cuba has a fairly literate rural population. Within a year after introduction of the *Campesino a Campesino* approach in Cuba, over 600 urban farmers had been trained. Because of the need for alternatives to conventional high-external-input agriculture to maintain agricultural production in the "Special Period" and because of the highly active presence of the National Association of Small-Scale Farmers, the *Campesino a Campesino* movement grew very quickly in Cuba and is thriving to this day (Holt-Giménez 2005).

Impact on farmers' livelihoods

In Guatemala, the maize yields of experimenting farmers doubled within the first couple of years after starting their experiments (Holt-Giménez 2006). This early success encouraged the farmer-promoters to continue exploring new technologies through experimentation. They were also motivated by gaining prestige in the community and beyond, having the opportunity to travel to other areas, having easy or free access to appropriate tools, seeds and credit, and — in some cases — receiving a small salary.

According to Holt-Giménez (2006), "hundreds of thousands" of smallholders in Latin America have reclaimed eroded land, raised productivity and improved their livelihoods through the *Campesino a Campesino* movement.

In early 1999, Holt-Giménez designed and coordinated participatory research to assess how 1998 Hurricane Mitch had affected the plots of farmer-experimenters in the *Campesino a Campesino* movement compared with other farmers. A total of 1,804 plots — 902 agroecological and 902 conventional — in 360 communities spanning 24 departments of Honduras, Nicaragua and Guatemala were selected, and 1,738 were later considered to have valid data for analysis. Forty NGOs involved in agroecology projects trained 100 teams of agricultural technicians and farmer-promoters, as well as all the farmers selected for the study, to make paired observations of specific agroecological indicators. Pairs of plots in close proximity to each other, in the same position and cardinal orientation in the watershed, with the same general slope and similar environmental surroundings in terms of fields, trees, infrastructure, etc., were compared according to agroecological indicators: topsoil depth, rill and gully erosion, percent vegetation, crop losses, and damage to soil and water conservation structures. The findings revealed higher "agroecological resistance" of the agroecological plots: 28–38 percent more topsoil, 3–15 percent greater soil moisture, and less gully and rill erosion than in the conventionally farmed plots (World Neighbors 2000). Primarily because of their higher crop diversity, the agroecological plots had, on average, lower economic losses; in Nicaragua, some of them even showed profits despite the hurricane. Over 90 percent of the conventional farmers who took part in the study expressed interest in adopting their neighbors' practices. The authors of the study report, also proponents of *Campesino a Campesino*, felt that this "demonstrated the social, environmental and agricultural advantages ... of farmer-led approaches to sustainable agriculture." This study was the first time that *campesinos* had ever collaborated on a regional research project.

Enhanced local capacity to innovate

The local experiments led to renewed interest among the *campesinos* in low-external-input and sustainable agriculture (LEISA) techniques. The broad impact of *Campesino a Campesino* in promoting such techniques came mainly through the scaling out of small-scale experimentation by as many farmers as possible, which was an objective built into the approach from the outset. In Ometepe, for example, the number of farmer-experimenters was quickly expanded from 17 to over 100 by the second year of the project. The attractiveness of the approach lay not only in the increased yields and lower costs for inputs and thus higher profits; great stress was given to the intrinsic value of sharing with and learning from each other within the farming community, giving one's time for the common good. Referring to the *Campesino a Campesino* approach, Holt-Giménez and Crus Mora (1993) stated, "the more social and moral its appeal, the broader the movement." By the late 1990s, an estimated 10,000 farmer-promoters and other farmers in Nicaragua were applying new LEISA techniques on their farms (World Neighbors 2000).

According to Holt-Giménez and Crus Mora (1993), the *Campesino a Campesino* approach "demystified the process of research." Farmers became confident that they could do their own research to find out what suits their situation best. They felt less dependent on external actors to bring solutions. They realized that they were capable of offering solutions themselves and communicating technological options to others (Merlet 1995 *In* Vasquez et al. 1995). Being involved in the process gave the farmers a taste for learning by doing and observing systematically, which gradually led to more systematic experimentation, such as using a standard size of experimental plots. Some farmer-experimenters formed small informal teams to exchange information and seed (Holt-Giménez 1992).

The national symposium of farmer-experimenters, as well as workshops, meetings and field visits, were used in Nicaragua to exhibit the farmers' experiments and to disseminate innovations from farmer to farmer. The visits of one group of farmers to another, even when these encounters appeared to be very informal, were reported to be moments of deep and productive mutual

learning, in which culture and agroecology were modeled and remodeled between actors. The experimentation on local knowledge reflected a set of social relationships that revolved around "common" forms of doing things, and the farmers felt comfortable sharing knowledge they had created themselves (Holt-Giménez 2008).

The impact assessments made by *Campesino a Campesino* proponents focused more on measuring the impact of the farming practices being tested and spread than on other aspects of the impact of the approach. However, in reflecting on the social impact of the action research to learn about the differential effects of Hurricane Mitch, World Neighbors (2000) concluded that this research had led to strengthened relations among technicians, promoters and other farmers; broader institutional networks; influence on local decision-makers; and women's involvement. The rural women who took part in the study said that it allowed them to break out of their traditional roles, raised their self-esteem and earned them recognition in their communities. One of the aims of the study had been to influence national policies for recovery and reconstruction, as well as related agricultural and natural resource management practices, but the results of the study did not appear to have had any notable impact in this regard. The farmer organizations and NGOs tended to focus on local-level technology-oriented work and gave little attention to policy influence for sustainable agriculture at the national level (Holt-Giménez 2001).

Farmer-promoters became respected as community leaders and were active in guiding processes of transformation in the lives of Central American farmers (World Neighbors 2000). Some became politically active beyond their villages and were elected as local representatives in government, such as in Mexico (Holt-Giménez 2006) — an indication of the personal development of these people, but also of the kind of person who is keen to become a farmer-experimenter or promoter.

Impact on formal and informal research and development organizations

The *Campesino a Campesino* approach did not focus on integrating the farmer-experimentation approach into governmental research and development organizations. Only in the Cuba case do the farmer-promoters work together with Ministry of Agriculture staff; this is a country where LEISA had already become a government policy. Elsewhere in Central America, the approach focused on increasing the autonomy of smallholder farmers, including in agricultural research and development, through their own informal and formal groups and organizations. Sustainable agricultural development based on farmers' experimentation and farmer-to-farmer learning was primarily practiced in village-level development initiatives by a diverse, loosely associated array of NGOs and community-based organizations with little influence on the formal research and development institutions and policies. The *Campesino a Campesino* movement decentralized the practice of agricultural research and development; according to Holt-Giménez (2008), this was both a measure of and an explanation for its successes.

The *Campesino a Campesino* approach was adopted by the national farmer union in Cuba and has maintained momentum there. In other Central American countries, however, even though the national unions have supported *Campesino a Campesino* work, the decision-making circles are dominated by medium- and large-scale producers interested primarily in conventional agriculture (Vasquez et al. 2000). Recently, free-trade agreements have ruined markets for small-scale farmers and dampened their enthusiasm for farming and experimentation, according to an email from Holt-Giménez.

The participatory research in assessing the impact of agroecological techniques in resisting the effects of Hurricane Mitch involved farmer-researchers in a regional international project, which roused their interest in setting up national and regional farmer networks to continue their research (Holt-Giménez 2001).

Summary of lessons learned

Lessons drawn by the documents

When farmer-led research is used as an approach to development, it makes site-specific exploratory and adaptive research a normal activity of the local farming population. The experience of working with farmer-promoters in the action research on the Hurricane Mitch aftermath led the farmers to the conclusion that farmer research networks would allow them to collect and analyze information about ecological farming, learn from each other, and identify priorities for regional research (World Neighbors 2000). In view of the limited capacity of government institutions to learn, an approach like *Campesino a Campesino* can make limited headway beyond the informal social networks connecting remote villages and the NGO world (Vasquez et al. 2000).

Support and encouragement by national and local organizations of small-scale farmers have played a strong role in spreading the *Campesino a Campesino* approach. Farmer organizations are in an especially good position to play this role in countries like Cuba, where they can work together with a supportive government structure and policy. Farmers have easy access to land, credit and markets, and agricultural scientists and technicians work in a decentralized way with many rural cooperatives, and can help farmers adapt practices quickly to specific agroecological conditions in different parts of the country. This allows smallholder family farming to thrive. In Guatemala, in contrast, Holt-Giménez reported in an email that an oppressive government regime eventually forced the self-organizing farmer innovators and promoters to flee the country. He comes to the negative prognosis that, despite the *Campesino a Campesino* work in Nicaragua, neoliberal economic policies have severely weakened the smallholder-farming sector, and family farmers — and their research and innovation activities — are doomed without a supportive national government policy.

The emphasis of the approach on learning by doing makes farmers realize their capacities to experiment and to come up with solutions to their everyday problems while exchanging with others; this strengthens their confidence and self-esteem (Holt-Giménez 1992; Merlet 1995 *In* Vasquez et al. 1995). In the words of a farmer, Argelio González, "The *Campesino a Campesino* is to help your brother find solutions and not to be dependent on the technician or on the bank" (Holt-Giménez 2008).

Lessons drawn by the study team

The pathway chosen for institutionalizing a farmer-led research approach depends greatly on the prevailing political conditions. Where the government structures and policies are not conducive to such an approach to agricultural improvement, it may be wiser to pursue it "under the radar" through less formal structures.

This case shows the great importance of CSOs in supporting farmer-led research and development in ecologically oriented agriculture. For such an approach to maintain its momentum and to spread, it is essential to have self-driven networks of farmer-promoters and linkages supported by farmer organizations and NGOs between different villages and districts to create space for farmer-to-farmer sharing and learning. However, at the same time — where the political conditions allow this — CSOs need to form strong networks to advocate for the economic space in which family farming can survive.

The linking of the concepts of innovation and solidarity, referred to as the "legs" of the *Campesino a Campesino* approach, points to the complex relationships among multiple actors in this approach. It refers to a broader commitment of the actors involved not only to themselves as individuals and families in their fight against poverty or oppression, but also to others. To share knowledge is a moral commitment in this cultural context. Farmers improve their farming system through collective processes of innovation, and their knowledge and methods are given recognition by the community. The more they share their knowledge and experience, the more they are valued by others — which contributes to their own self-esteem.

National symposia of farmer-experimenters, workshops, meetings and field visits are useful tools not only for disseminating innovations from farmer to farmer and increasing farmers' confidence in their own capacities but also for raising wider awareness in the country about farmers' achievements.

Sources of information and data

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Case 3: MASIPAG (Farmer-Scientist Partnership for Agricultural Development) to promote farmer-led sustainable agriculture in the Philippines

Introduction

Magasaka at Siyentipiko para sa Pag-unlad ng Agrikulutura (MASIPAG), or "Farmer-Scientist Partnership for Agricultural Development," was established as a result of the national *Bahanggunian ng mgalsyu Hinggil sa Bigas Conference*, or "Conference on Rice Issues," held in July 1985 in the Philippines. This conference discussed problems associated with genetically uniform, high-yielding varieties of rice requiring high levels of external chemical inputs that were being promoted through "green revolution" agriculture. A group of farmers who attended this conference concluded that there was a direct link between the problems they were experiencing and the approaches modeled by the "green revolution." High costs of production, decreasing rice yields, decreasing incomes and increasing debts were some of the problems mentioned. These farmers wanted to develop rice varieties that would not depend on chemicals and other high-external-input technologies and approached a group of scientists from the University of Los Baños to help them start up a rice-breeding program.

This resolve to breed rice themselves with the support of scientists was an act of self-determination that laid the foundation for the farmer-led, bottom-up approach of MASIPAG. These farmers donated the first 47 varieties of rice that became the first seed collection. MASIPAG was formally launched with the establishment of a three-hectare backup and research farm in 1986, which became the core of the rice genetic conservation and improvement program. Farmers and scientists worked closely together to produce the first MASIPAG rice cultivars by crossing varieties with characteristics desired by farmers.

Wider context. Since its beginnings as a small farmer-initiated breeding project in 1986, MASIPAG has evolved and grown in response to changes in the external environment. Throughout the 1990s, with the liberalization of agriculture, MASIPAG became known as a national program and then a national NGO on farmer-led sustainable agriculture. Thereafter, as the "gene revolution" gained ground and genetically modified crops were being commercialized in the Philippines, MASIPAG became a wider network that took on an advocacy role opposing genetically modified crops and promoting organic agriculture as an environmentally and socially sustainable approach to smallholder agriculture. MASIPAG can now be described as a movement for the protection of farmers' interests and the assertion of farmers' rights to development.

MASIPAG has offices in the three main regions of the Philippines: Luzon, the Visayas and Mindanao. It works in 45 of the 79 provinces of the country, with 20 provincial coordinating bodies. According to data from 2013 on its website, MASIPAG has 563 members' organizations, called people's organizations, with more than 30,000 farmer-members. It partners with 38 NGOs, 20 church-based development organizations and 15 scientists from various universities in the country. It has a staff of 40. Misereor, based in Germany, has provided funding support to MASIPAG since 1987. The Swedish Society for Nature Conservation, the Catholic Lenten Fund and Trócaire have also funded it. No data could be obtained on the volume of funding.

Theory of change. If farmers are able to breed varieties that suit their needs and locally specific conditions and convert to organic farming, they can break their dependency on high-yielding varieties that require high levels of external inputs and can grow food that is safe and healthy. This, in turn, will reduce their production costs, increase biodiversity on their farms, and ensure that their families have sufficient and healthy food year-round. All of this will help them break free of debt and regain control over production on their farms.

Approach and process

Ensuring food and livelihood security for smallholder farmers, upholding their right to be in control of their farms, sustaining their natural resources and becoming social change agents are the underlying goals that have driven MASIPAG from its inception to the present day — although its scale has changed from a small rice-breeding project to a national movement. Farmers in MASIPAG have worked toward these goals by becoming competent plant breeders who are able to breed varieties that suit their needs and purposes; converting to organic farming in order to reduce use of external inputs and to grow safe and healthy food for themselves and the market; working collectively to accrue more benefits and exercise more control over aspects such as marketing; sharing knowledge and experiences with others; strengthening the leadership and organizational capacities of members; and making strategic alliances with other development actors to lobby for farmers' rights.

MASIPAG's approach to development is farmer-led and bottom-up. It aims to transform not only how people farm but also how they live and care for each other and for nature. "Even if one is practicing a full organic system with MASIPAG seeds, if he has no concern for other farmers and society, then he cannot be considered a true MASIPAG farmer" is how one farmer described the approach (Bachmann et al. 2009).

MASIPAG's approach encompasses the following elements (Cruzada 2010):

- **Bottom-up approach.** Decision-making, planning and implementation in the organization come from the members; this is coordinated through farmer groups and a decentralized organizational structure.
- **Farmer-scientist-NGO partnership.** The organization is run as a process of mutual ongoing learning between farmers, scientists and NGOs.
- **Farmer-led research.** Research, including breeding new varieties of rice, is designed and conducted by farmer-members for farmer-members.
- **Farmer-to-farmer mode of diffusion.** Training in the network is largely conducted by farmer-trainers using a wide range of techniques, including trial farms, exchange days and cultural events.
- **Opposition to technological fixes.** Change needs to be understood in a holistic way, including attention to farmer empowerment and farmer knowledge.
- **Advancing farmers' rights.** MASIPAG works within a broader commitment to farmers' rights, which include rights relating to land, seeds and genetic resources, production, biodiversity, politics and decision-making, culture and knowledge, information and knowledge, and information and research.

For farming households that engage with MASIPAG, the main challenges are long-term food security and farm stability amid constant external changes. They experiment with ways of regaining an ecological balance on their farms by using organic and integrated farming systems, including local seeds and technologies for crop and livestock production as a means of reducing production costs,

increasing productivity and ensuring resilience of the farm. These farming families are encouraged to work together in groups called people's organizations. These groups form the basis of the MASIPAG structure and are the level at which most work is done, training is conducted and decisions are made. The people's organizations provide a space for farmers to learn more about MASIPAG varieties, source and exchange seeds, share labor, exchange ideas, and create an alternative network that replaces the dependence on trader-usurers. The people's organizations create work-specific committees to deal with challenges that are common to them. For example, a people's organization faced with constant flooding had a committee that engaged in breeding flood-tolerant rice varieties. Communities are able to achieve larger, community-level goals — for example, increasing market access and value of farm products, or improving land-tenure arrangements — through working together as people's organizations. Provincial and regional leaders and staff encourage and guide the people's organizations in developing, implementing and monitoring their plans and activities. Farmers whose skills are gradually strengthened through their involvement in these organizations are trained in advocacy skills by functional advocacy committees at provincial level. Thus, farmers become agents of change on their farms, in their communities and in the country, moving from being farmer-researchers to being farmer-trainers and farmer-leaders, and then to being entrepreneurs and processors, and finally to becoming lobbyists, campaign organizers and public speakers.

Impact

MASIPAG, in cooperation with Misereor, conducted an impact assessment in 2007–2008. The survey included 840 farmers — 280 MASIPAG farmers who had fully adopted organic farming, 280 MASIPAG farmers who were in the process of converting to organic farming, and 280 conventional farmers as a reference group. The average landholding of farmers in the study was 1.5 hectares, and the average farm household comprised five persons. The survey was carried out in all three regions: Luzon, the Visayas and Mindanao. The results of each regional study were presented to farmer groups of the region in two-day validation workshops. Data at national level were validated at a three-day workshop, which included MASIPAG farmer-leaders and staff, as well as NGO representatives and collaborating scientists. The impact assessent team was led by a male German agronomist and included the coordinator and the data specialist of MASIPAG — both female — and a female professor from the Agricultural Systems Cluster of the University of Los Baños; all three women were Filipino. If not otherwise indicated, the data below are from this impact assessment.

Findings from the farmer-led research

Rice seed improvement has been a major focus of MASIPAG's research. The network has been responsible for conserving and breeding thousands of rice varieties. It has collected over 1,000 traditional rice varieties. Farmer-led breeding has developed 1,069 varieties that are adapted to local agroecological conditions and 273 rice crosses that resulted in 185 farmer-selected lines. The farmer-breeders are spread throughout the country, ensuring that breeding work is taking place even in the remotest locations. The study found that the rice yields of farmer-bred varieties were on par with high-yielding varieties used by conventional farmers — average yields between 3,287 and 3,478 kilograms per hectare for all three groups. In addition, the study found that the rice yields of MASIPAG organic farmers[13] were increasing over time, in contrast to the declining yields of conventional farmers. The study confirmed that farmers could obtain high yields without using expensive and environmentally damaging chemicals and by using crop varieties bred by farmers themselves.

With seed selection and breeding in the hands of farmers, the trial-farm approach ensures that MASIPAG farmers can compare all varieties under their local conditions and select the most appropriate for mass production. MASIPAG farmers take a very active role in maintaining seed stocks. The study found that 77 percent of them practiced seed selection, as opposed to 25 percent of conventional farmers. Verification trials, where varieties are tested for their performance under local conditions, were undertaken by 70 percent of MASIPAG farmers, while the practice was almost unknown among the conventional farmers.

By continuous seed selection, the properties of varieties can be preserved and yield levels maintained and gradually improved over longer periods of time. About three-quarters of the MASIPAG farmers had adopted these seed-management practices.

The MASIPAG approach encourages diversity within the rice-based system. MASIPAG farmers grew 4.8 varieties of rice on average, in comparison to the average of 1.6 varieties grown by conventional farmers.

Impact on farmers' livelihoods

The study looked at several aspects of food security and food sovereignty in the period 2000–2007: accessibility of food, quality of food (nutrition, diversity and safety), freedom from vulnerability (reliability of food sources, minimized risk) and control over production (autonomy and self-reliance). It revealed that the food security has improved significantly: 88 percent of MASIPAG fully organic farmers reported that their food security was much better or better than in 2000, and only 2 percent said they were worse off. Among the conventional farmers, 39 percent said their food security was much better or better than in 2000, while 18 percent said they were worse off. This could be explained by the fact that MASIPAG farmers grow most of their food on their farms, while conventional farmers rely on the income they generate from their farms to buy food.

MASIPAG farm families had a more nutritious and balanced diet than families in the reference group. They ate 68 percent more vegetables, 56 percent more fruit, 55 percent more protein-rich staples and 40 percent more meat than in 2000, compared with 34 percent, 40 percent, 15 percent and 16 percent respectively in the reference group. As one farmer-leader stated: "The difference between the MASIPAG and the non-MASIPAG is the diversity. The non-MASIPAG has a monocrop. The MASIPAG has different crops. There [are] a lot more sources of food. The complete nutrients come from the food you are growing."

MASIPAG farmers consider their organic food healthy and safe — that is, free of chemicals — and regard growing crops without chemical pesticides as vitally important. In this context, the survey investigated changes in the health status of household members. Among the MASIPAG farmers, 85 percent rated their health much better or better than in 2000. In the reference group, only 32 percent rated it positively, while 56 percent saw no change and 13 percent reported worse health.

The study also looked at household income. The net agricultural income — gross agricultural income less production costs — of MASIPAG farmers was PHP 36,093 per year, higher than that of conventional farmers at PHP 30,819 per year. In terms of livelihood — net agricultural income plus value of farm products consumed by household — the figures were even more favorable for MASIPAG farmers at PHP 69,985 per year compared to conventional farmers with PHP 54,915 per year. Nearly three-quarters of the MASIPAG farmers interviewed stated that their income had risen in the period 2000–2007; 6 percent said it had decreased. Among the conventional farmers, 31 percent reported an increase in this period and 37 percent a decrease. Looking at the poorest quartile of respondents in both categories, it was found that the MASIPAG farmers' net agricultural income was 1.5 times that of conventional farmers. The annual household cash balance for MASIPAG farmers showed a positive balance of PHP 4,719, compared with a negative balance of PHP 4,992 for the conventional farmers, indicating that the former could accrue some savings. However, in the poorest quartile of households, both MASIPAG and conventional farmers show losses, although the losses are much greater for the latter.

With respect to environmental impacts of the approach, the study revealed that the practices used by MASIPAG farmers had a positive effect. On-farm diversity of crops and livestock on MASIPAG farms was much higher than on the farms of conventional farmers. MASIPAG farmers grew and used 45 different crops on average, compared to 30 for conventional farmers. The use of chemical fertilizers had also dropped drastically in the case of MASIPAG farmers. In fact, none of the MASIPAG respondents in the study were using chemical fertilizers; they had all moved to alternatives such as farmyard manure, green manure, rice straw recycling and biofertilizers. In contrast, 85 percent of the conventional farmers used chemical fertilizers. The same trend was seen in the application of chemical pesticides and herbicides: MASIPAG farmers had stopped applying such substances and were using alternative, environmentally friendly forms of pest and weed management. However, most of the conventional farmers continued to use chemical substances to manage pests

and weeds. A majority of the MASIPAG farmers also reported significant increases in soil fertility, reduction in soil erosion, and increased tolerance of plants to pests and diseases. In contrast, many of the conventional farmers reported the opposite: decreased soil fertility, increased soil erosion, and plants becoming more susceptible to pests and diseases.

A key element of the approach is farmer-to-farmer diffusion. This happens not only through organized events such as training, exchange days, trial farms, etc., but also by MASIPAG farmers sharing experiences with their neighbors. In fact, the group of MASIPAG farmers in the study who are in the process of conversion to organic agriculture could be considered farmers who have been inspired by the approach. In all impact categories mentioned above, this group of farmers showed better results than conventional farmers.

Enhanced local capacity to innovate

MASIPAG's approach goes beyond enabling farmers to achieve food security and livelihood improvements at household level. It encourages farmers to build their knowledge and skills by taking up various roles and responsibilities within the network. The farmers who have been involved in plant breeding of rice and maize and other organic agricultural practices have enhanced their skills to become farmer-breeders and farmer-trainers. Working together in people's organizations has also offered farmers opportunities to strengthen their organizational and leadership capacities. The study states that every second MASIPAG farmer is a people's organization leader, every third is a farmer-trainer or committee member, every tenth a rice breeder, and every twenty-fifth a maize breeder.

The farmer-trainers play a key role in farmer-to-farmer diffusion of the approach. At the time of the study, MASIPAG had 142 farmer-trainers who were supporting and coaching new and less experienced members of the network in technological and social aspects of the approach. The trial farms set up by the people's organizations with access to MASIPAG seeds provided a space for farmer research activities and hands-on learning. According to 2008 data, there were 273 trial farms in 40 provinces. The study team asked the respondents to review the overall effectiveness of agricultural extension delivered by a range of service providers. MASIPAG farmers as well as conventional farmers gave MASIPAG the highest rating, over and above extension services provided by the government, other NGOs and the church.

MASIPAG farmers also refer to benefits achieved through collective work in the people's organizations. One of the key benefits is communal labor arrangements, which allow MASIPAG farmers to pool labor for work on each other's farms. Reviving of this traditional system has helped strengthen community cooperation, built solidarity and reduced the need to hire labor. Marketing is another activity that the people's organizations have undertaken, forming marketing cooperatives to negotiate better terms and better prices for their produce. A MASIPAG farmers' guarantee system has been set up to assist with certification of organic produce and to build joint marketing mechanisms. This system functions through the use of voluntary services and does not charge farmers for setting up, certification and payment to controllers. This was a very new development at the time the study was done, but already 16 percent of the MASIPAG farmers interviewed reported selling their organic produce through this scheme. Farmers in marketing groups had higher incomes than did the others.

MASIPAG farmers reported a sense of optimism and a feeling that they could make a positive change not only in their own lives but also in their communities. This differed greatly from the feeling of despondency expressed by conventional farmers. When asked to list positive or negative changes in their families or communities, MASIPAG farmers came up with 67 positives. At the individual level, these included safe and sufficient food, better health, higher yields, more income and savings, and more knowledge and skills. At the community level, they mentioned more people wanting to join MASIPAG groups, increased awareness about organic farming, more demand for organic produce, and replication of some MASIPAG practices by their neighbors. The two most common responses of the conventional farmers to this question were simply "no change" and "no answer."

MASIPAG as an organization has a clear policy on gender. Women are active at all levels, including in the national and regional boards. The majority of the staff is female. Among people's organization leaders and plant breeders, there are significant numbers of women, but men are in the majority. In relation to household decision-making, the study revealed that men dominated in all respondent categories. However, there was some change toward joint decision-making within households belonging to MASIPAG groups.

Impact on formal and informal research and development organizations
The impact study did not focus on the impacts that MASIPAG may have had on other agricultural research and development actors and institutions. However, information gathered from other sources gives some indication of its influence in this respect.

MASIPAG has not aimed at integrating its approach into governmental research and development institutions. Instead, it has scaled out its approach to a large number of farmers and evolved into a national network and movement of farmers that can dialogue and debate with government. It also partners with many NGOs and church-based organizations in the Philippines in matters related to protecting the rights of smallholder farmers.

In 2011, the International Federation of Organic Agricultural Movements (IFOAM) recognized MASIPAG's participatory guarantee system for organic produce, which allows it to use the IFOAM participatory guarantee logo on informational material. MASIPAG is the first organization in the Philippines to be given this approval. It also represents NGOs on the National Organic Agriculture Board, the national policymaking body related to organic agriculture.[14]

MASIPAG is known nationally for its campaigns to protect farmers' rights to freely save, re-use and propagate seeds and to disseminate technologies that are sustainable and controlled by farmers. With the commercialization of genetically modified organisms in the Philippines in 2002, it has carried out large-scale awareness campaigns, undertaken research on the socio-economic impacts of genetically modified crops and lobbied against field trials with such crops. MASIPAG was among the petitioners who filed the Writ of Kalikasan (Writ of Nature) against the field-testing of Bt eggplant, which was favorably upheld by the Court of Appeal in September 2013.[15]

In December 2013, MASIPAG was awarded the *Gawad Bayani ng Kalikasan*, or "Heroes for the Environment Award," recognizing its contribution to the welfare of the people and the environment by exemplary actions and advocacy, education, research, technology, development, community services, mass media and cultural work.[16]

Summary of lessons learned
MASIPAG has demonstrated that farmers can take the lead in developing an approach to sustainable agriculture that provides rural poor people with food and livelihood security, builds their confidence, gives them control of their lives, and makes them resilient in the face of change. It has delivered positive outcomes also for the poorer farmers. Despite the fact that converting their farms to a fully organic system using farmer-bred seeds is costly and time-consuming, farmers have seen its benefits and are willing to make the conversion.

The strong focus on capacity building and mutual support within MASIPAG has enabled its farmers to take up a range of roles and responsibilities and to function in different capacities across the network and beyond. This has helped to build a large pool of farmers with expertise in plant breeding, training, leadership, entrepreneurship, etc., who are able to nurture and sustain the network. In addition, farmers are taking on political roles by being advocates and campaigners.

While pursuing a farmer-led research approach, MASIPAG has also established itself as a network that is truly farmer-led and created an organizational culture that is respectful of farmers. Farmers are the key decision-makers and implementers of the different activities. Scientists in the partnership play a supportive and facilitating role, providing their knowledge and skills to farmers and enabling them to continue research on their own.

Misereor has supported MASIPAG for more than 20 years. This long-term commitment of a donor that has recognized the value of the approach has helped MASIPAG to invest in building up the capacity of the network slowly but surely.

Sources of information and data
Project or NGO documents
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Case 4: Farmer-experimenters in Honduras

Introduction
The US-based NGO World Neighbors worked for about 30 years with smallholders in Central America to strengthen their capacities to improve their own farming. World Neighbors started with the Chimaltenango Program in Guatemala in the early 1960s and began to focus explicitly on a small-scale experimentation or "farmer-experimenter" approach in the late 1960s. The available documentation on this approach commences with the San Martin Jilotepeque Program for farmer-led development in Guatemala during 1972–1979. However, this case study focuses primarily on the documentation of the work of World Neighbors and its partners in Honduras. A main partner in this work was the *Asociación Coordinadora de Recursos para el Desarrollo* (ACORDE) or "Association of Resource Management for Development."

Several village leaders trained in Guatemala moved — seeking political asylum — to Honduras to staff World Neighbors' Guinope Integrated Development Program during 1981–1989 and Cantarranas Integrated Development Program during 1987–1993. World Neighbors set up similar projects in El Rosario, Comayagua Department, and in Choluteca on the coast, all primarily to support farmer experimentation with green manures. Altogether, 20 development organizations, including 12 NGOs (World Neighbors; ACORDE; the *Asociación de Consejéros para una Agricultura Sostenible, Ecologica y Humana* (COSECHA) or "Association of Advisors for Sustainable, Ecological and People-Centered Agriculture"; Catholic Relief Services (CRS); Foundation of the Honduran Coffee Bank; Oxfam UK and others), three governmental organizations (the Honduran Ministry of Agriculture, the Honduran International Coffee Institute and the German Agency for Technical Cooperation) and two academic institutions (Cornell University and Zamorano Panamerican Agricultural School) operated at least 30 development programs working three to 10 years in Honduras, all taking a farmer-experimenter approach. World Neighbors continued working with the farmer-experimenter approach until the end of the 1990s. In the 1990s, the *Centro Internacional de Agricultura Tropical* (CIAT) or "International Center for Tropical Agriculture," based in Colombia, also established a farmer-experimenter program in northern Honduras.

The San Martin project, funded by Oxfam UK, worked in some 45 villages with Cakchiquel Indian families with landholdings of less than 0.5 hectare on average, which would be classified in Guatemala as extremely poor. The Guinope Program worked in 41 villages, most of them in the townships of Guinope, San Lucas and San Antonio de Flores in southeastern Honduras. The Cantarranas Program, working in 35 villages around the central Honduran town of Cantarranas, involved over 600 family farmers at midterm — after 3.5 years — and expected to reach 1,300 farmers by the end of the project in Year 7. These farm families had landholdings of two to five

hectares. Funded by CRS, this program expected to have invested US$ 400,000 by the end of seven years (Bunch 1990), but there are no final data verifying this.

The wider context of political, socio-economic and organizational factors that influenced the work and impact of World Neighbors is extensively covered by Eric Holt-Giménez (see Case 2).

Theory of change. When farmers experiment, they increase their agricultural knowledge and their ability to improve and diversify their farming, thus producing something valuable to share with each other and to help each other improve. If farmers' ability to experiment and share their newly acquired knowledge is strengthened, they will be able to carry on the process of agricultural improvement by themselves. Rapid and recognizable success when experimenting with an advantageous technology stimulates enthusiasm among farmers and is a driving force behind future innovation. Long-term impact depends on farmers' capacity to continuously adjust their technologies to changing conditions in accordance with their own value system. This theory is the basis of the book *Two Ears of Corn* (Bunch 1982), which (in Spanish) guided all of the projects and programs in Honduras.

Approach and process

A typical start to the farmer-experimenter approach is farmer-to-farmer exchange. For example, farmers from Cantarranas went to see experiments in El Rosario and became convinced that they would like to try something similar. The Cantarranas Program staff told them that there were no ready-made solutions. They taught the smallholders how to carry out simple experiments by themselves and encouraged them to try out on a small scale a small number of new technologies that depended primarily on inexpensive and locally available resources. The farmers were taught in small groups of 10–20 in a series of field-based courses lasting one to two days each, spread over the agricultural cycle. Over time, much of the "teaching" was being done by the participants themselves. Rapid and recognizable success in the experiments, rather than artificial incentives or subsidies, motivated the farmers to spend more time trying out new ideas and innovating.

The initial focus in the experimentation was on soil recuperation, because World Neighbors had identified depleted soils as the main factor limiting agricultural productivity in the program areas. In San Martin, contour ditches and side dressing of nitrogen on maize were used as starter technologies to motivate farmers. The first technologies tried out by farmers in Guinope were drainage ditches and fertilizing with chicken manure, and later cover crops and strip tillage. In El Rosario, experiments were conducted with green-manure crops, such as growing them in the dry season or intercropping them with maize. In Cantarranas, the initial technologies were green manure, cover crops and drainage ditches, and later hedgerows, microterraces, strip tillage and growing vegetables as cash crops. This program sought to triple the yields of farmers' traditional basic grain crops through the use of entirely on-farm sources of fertility. The farmer-experimenters selected and adapted the technologies according to their costs — including those of maintenance — and benefits. Within two to three years of starting systematic experimentation, the farmer-experimenters were teaching other farmers, usually on a volunteer basis. The program trained leading farmer-experimenters as local extensionists and gave them a small stipend.

World Neighbors focused on enhancing the capacities of individual farmers so that they could establish and manage experiments in order to modify known technologies and develop new ones, spread knowledge of useful technologies to other farmers, and continue the process of agricultural investigation and extension without external support. It gave little attention to developing structures or mechanisms for widespread sharing of innovations developed by the farmer-experimenters beyond farmer-to-farmer directly and no attention to helping farmers set up structures such as networks and organizations for sharing technological information and achieving their other objectives. According to Bunch in a March 2014 email, the program saw motivation as the primary ingredient needed to sustain the development process. Without motivation, structures would be worthless, but without structures, motivated people would create them. In San Martin, the work supported by World Neighbors integrated agriculture, health, road construction, functional literacy and cooperative organization. In Guinope, the work revolved around soil recuperation, basic grains, diversification and preventive health.

In the late 1990s, COSECHA supported experimentation by farmers focused on water management. Twelve farmer-experimenters in Honduras known for their creativity and good experimentation skills were asked by COSECHA and agreed to try out different ways of lining microcatchments for harvested rainwater. Risks were involved because there was no proof that the technology would work. Therefore, COSECHA provided the sand, lime and rocks. In return, the farmer-experimenters agreed to keep records of costs, benefits, problems, different sources of rainwater such as patios, footpaths and natural temporary waterways, and different uses of the water in the microcatchments. Exchange of ideas between the farmer-experimenters helped them identify suitable microcatchment sizes and lining materials, new ways of repairing the microcatchment walls, and new ways of using the water, such as with backpack sprayers (López and Bunch 2000).

Impact

In 1994, COSECHA undertook a study commissioned by the International Institute for Environment and Development (IIED) in San Martin, Guinope and Cantarranas to assess the impact of soil-conservation projects up to 15 years after the end of intervention. The methodology combined plot observations using a checklist, open-ended interviews with individuals using a question guideline, discussions with resource persons, participatory rural appraisal (PRA) techniques with groups of villagers, and a review of program documents.

In 1999–2001, COSECHA carried out another study in Honduras to find out what technologies the farmer-experimenters had continued to develop on their own. With a three-year grant from the International Development Research Centre (IDRC), COSECHA selected 120 farmer-experimenters in Honduras reputed to have developed interesting postintervention technologies. A trained agronomist who was the son of a farmer-experimenter conducted semistructured interviews with the farmer-experimenters, covering a list of 20 issues, and described the successful technologies in detail, including cost-benefit analysis. The study team collected information only on technologies that farmers had developed after the end of the project in their area, and rated the technologies according to the economic benefits to farmers, and how widely they could be applied. Bunch and Canas (2001; 2002) compiled intermediate results of this study, based on interviews with 52 farmer-experimenters in 10 of the 23 departments in Honduras. Although women are not normally involved in crop farming outside of the homestead garden and had not been trained by the development programs in the 1980s and early 1990s, seven of the 52 farmer-experimenters interviewed were women. Most of the information in this section comes from these two studies.

Findings from the farmer-led research

The 1994 study revealed that the long-term impact did not derive from the specific technologies that were taught. As the situation of the farmers changed, the farmers constantly had to develop, adopt or adapt new technologies. The vast majority of the soil-conservation technologies that were most highly successful in the short term had a "half-life" of about six years; in other words, after six years, they were still being used by 50 percent of the farmers who had originally adopted them. The increased yields were due to an ongoing farmer-managed and farmer-driven process of experimentation and innovation (Bunch and López 1994; 1995).

The farmers who experimented with intercropping in Cantarranas introduced green-manure species into maize and found that mucuna (*Mucuna pruriens*) was best adapted for this purpose in climatic areas ranging from semiarid to high rainfall at altitudes from sea level to 1,700 meters (most of Honduras). Mucuna could fix as much as 150 kilograms of nitrogen per hectare. On the north coast of Honduras, farmers who did not use mucuna-intercropping techniques produced an average of about 800 kilograms per hectare of maize, while those that had used mucuna for five years averaged 2.2 metric tons per hectare and those that had used it for 20 years or more averaged 2.6 metric tons per hectare (Bunch and López 1995). Small-scale experiments were particularly appropriate for introducing technologies like green manure to farmers who were not familiar with the advantages of organic matter, the effects of which become evident only in the next cropping season after growing the green manure.

The 1999–2001 study (Bunch and Canas 2001; 2002) revealed that the 52 farmers interviewed had developed 82 new technologies which they continued to use — mainly agronomic but also some postharvest and food-preparation technologies. The study team classified 39 of the technologies as meriting further validation, and depending on results, wider dissemination. The original intervention had emphasized soil conservation and grain production practices such as spacing, but the farmers experimenting on their own had switched their focus to managing soil fertility (10 technologies) and controlling crop pests (15) and diseases (eight), which accounted for almost three-quarters of the new technologies they developed and 85 percent of the most promising ones. This suggests that the farmers had developed different priorities than those of the earlier programs, probably because the soil-depletion problems had been addressed well enough so that crop pests and diseases had become the new limiting factors to production. It was for this reason that World Neighbors had focused on local experimentation. When one problem is solved, new limiting factors inevitably emerge. As Bunch reported in a March 2014 email, World Neighbors expected that, after the intervention ceased, the farmer-experimenters would remain as sources of agricultural development.

Examples of the new technologies developed by farmer-experimenters on their own included low-cost ways of controlling aphids, maize borer, leafcutter ants, late blight and damping off, as well as various foliar fertilizers. All of the locally developed technologies could be labeled "low-external-input," and many of them were totally organic. They required little or no cash outlay, used locally available resources, did not increase risk, brought fairly quick and recognizable returns — except for a couple of experiments involving trees — and were highly cost-efficient (Bunch and Canas 2001; 2002).

Bunch (1998) estimated that well over 200,000 farmers in Central America were using green-manure or cover crops by 1998; however, many were using them in indigenous cropping systems largely invisible to outside professionals. In cases where green-manuring systems had been introduced from outside, villagers had used the new seed — such as for mucuna — but adapted the planting dates, seeding rates, crop associations and management regimes to their own specific needs.

Impact on farmers' livelihoods

The 1994 study revealed that the wider use of the soil-recuperation techniques with which farmers had experimented meant that they no longer had to fallow their land or burn forests to create new plots every two to four years; they could use the same land for 15–25 years. Land productivity had continued to improve in San Martin, Guinope and Cantarranas. Activities in soil conservation had been sustained. In San Martin, average yields of maize had been about 400 kilograms per hectare when the project started. The best farmer-experimenters were achieving 2,400 kilograms per hectare when the project ended and about 4,500 kilograms per hectare 15 years later in the villages studied. Their bean yields were 75 percent higher than when the project ended. It is not clear in the documentation what other factors besides farmer experimentation may have led to these increases. Temporary outmigration to seek wage labor had been almost eliminated and permanent migration to cities had been reversed, especially in Guinope, known before 1981 as a dying town. Other impacts recorded were higher wage levels and land values; increased local savings that led to decreased dependence on formal credit and increased investment in education, land improvement and livestock; improved human diets, with more vegetables, native herbs, milk and cheese; more advanced village organization; and improvements related to the technologies applied, including decreased resource degradation, increased number of trees planted, almost total elimination of herbicide use, significant reduction in use of chemical fertilizers, increased crop diversity and intercropping practices.

Of the over 600 farm families that took part in the first three to five years of the Cantarranas program, at least 50 were earning at least five times more income from cash crops such as carrots, potatoes and onions than at the outset (Bunch 1990). Moreover, 10 of the 52 farmer-experimenters interviewed in 1999 had in the meantime become employees of rural development programs (Bunch and Canas 2001; 2002).

In San Martin, Guinope and Cantarranas, farmer-tested technologies spread spontaneously within villages but more slowly than had been expected, and there was no spread between villages. The poorer farmers had taken up the technologies more quickly and had gained more benefits than had the wealthier farmers because of the nature of the soil-related technologies, which work best on poorer soils, require no capital, involve traditional crops and are difficult to mechanize (Bunch and López 1995). López (1992 *In* Bunch 1998) noted that, when projects used incentives to motivate adoption of hedgerows, only 5–10 percent of the adopters were still maintaining the contour hedgerows two years after project end, whereas up to 15 years after project end in other areas where no incentives had been given, 90–135 percent of the number of original adopters continued to maintain hedgerows (Bunch and López 1995). Farmers without grazing animals had changed from using Napier or King grass to using nonfodder multipurpose species such as pineapples, lemon grass and medicinal plants in the hedgerows.

On their own, farmer-experimenters had developed technologies that led to "greatly increased yields or reduced unit costs." The farmer-experimenters were proud of what they had developed themselves and readily shared information about technologies with their neighbors, but did not make special efforts to spread the technologies more widely. Most of the new technologies were not highly visible and therefore could not be easily observed by others. In no case did a locally generated technology spread to more than 10 other farmers through the efforts of the farmer-experimenters. In two cases — use of coffee pulp as a fertilizer and intercropping of jackbeans with cassava — the technologies had been disseminated throughout Honduras because NGOs had discovered farmers using them and had decided to make them widely known (Bunch and López 1995; Bunch and Canas 2001; Bunch and Canas 2002).

According to a December 2013 email from Bunch, when he visited San Martin, Guatemala, in 2010, he counted more than 90 locally produced crop species being sold in the municipal market. In 1972, when the program had started in San Martin, there were only seven: maize, beans, coffee, wheat, oranges and two species of squash. At the end of the program in 1979, there were about 25 species, mainly as a result of farmers' initiatives. In Guinope, Honduras, Bunch found farmers producing at least two dozen species of vegetables for the Tegucigalpa market; half a dozen pickup trucks were leaving the township every day full of vegetables. Many of these species the farmers had learned to grow themselves. In 1981, when World Neighbors started working in Honduras, Guinope farmers were selling only two vegetable species: radishes and garlic. Bunch regards this change as evidence of "a dynamic of widespread farmer experimentation."

Enhanced local capacity to innovate

Long after the programs closed, numerous innovations never thought of by the programs had been developed by and spread among local farmers. Bunch and López (1995) report from the impact study sites that the overall level of continuing innovation was remarkable after intervention stopped. Hundreds of smallholder farmers continued to experiment and develop new technologies in the up to 12 years since an outside agency stopped working in the area. For instance, in San Martin, over 30 new technologies and in Pacayas, a village in the Guinope area, 16 new technologies had been developed or taken up successfully by farmers after program termination.

The programs regarded local experimentation as a critical factor for the villagers to become subjects of their own development. By using a list of 18 criteria, including simplicity, low cost, positive ecological impact, rapid and recognizable results, and the possibility to serve as a basis for other innovations, the villagers were able to identify or develop locally appropriate technologies. Innovation had continued through farmer experimentation and local development of new or adjusted technologies. These activities appear to have expanded to some extent, seeing as people who were not trained as farmer-experimenters came to be known as farmer-experimenters, such as the seven women identified in the 1999–2001 study. However, the impact studies investigated mainly the spread of technologies rather than the spread of farmer experimentation, even though the advocates of the farmer-experimenter approach always stressed that the latter is just as, if not more, important.

The 1999–2001 study revealed that farmer-experimenters had developed large numbers of "very significant and original" technologies (Bunch and Canas 2001; 2002). Referring back to this study, Bunch wrote in an email in December 2013, "In 1999, COSECHA brought together a large group of about 70 of the best farmer-experimenters from around Honduras that World Neighbors and COSECHA had trained. They presented their best discoveries over the years, much like professionals do in a major international conference. The creativity and the value of the technologies they had discovered was mind-boggling."

All 52 farmer-experimenters interviewed during this study expressed interest in learning more about agricultural technology and said they would be interested in joining a regional or national organization of farmer-experimenters or villager-extensionists. They talked of the importance of dialogue, learning from each other and joining hands for the common good. Most of them thought that the main objective of such a farmer-experimenter organization would be to share and disseminate agricultural technologies, both their own and those generated by scientists. The second and third priorities for such an organization would be to develop markets for agricultural produce and to have greater influence on government policy to favor small-scale farmers.

Impact on formal and informal research and development organizations
As the World Neighbors projects did not aim at institutionalizing its approach in formal research and development organizations, the documents do not report on this. However, Bunch and Canas (2001; 2002) do mention that three governmental organizations — two Honduran and one German — and two academic institutions were following similar approaches in Honduras in the 1980s and early 1990s. Already in 1990, Bunch wrote that about 65 development agencies working in Bolivia, Guatemala, Haiti, Honduras, India, Indonesia, Kenya, Mexico, Nepal, Nicaragua, Peru, the Philippines and Togo had started to work with villager-extensionists in a similar way as in the Cantarranas program.

Bunch and López (2000) reported that the collaboration with farmer-experimenters on water management led to identification of important roles for formal researchers, such as applying statistics to analyze data collected on farmer-developed or farmer-tested technologies and doing studies to explain the results and investigate different aspects or modifications of promising technologies. However, they did not indicate whether formal researchers actually performed these roles.

The farmer-experimenter approach influenced a large number of NGOs and some development projects and government agencies in Central America to use farmer-led research and extension methods. According to Bunch (1998), this was one reason for a "major movement of soil improvement" on the hillsides of Central America.

Impact of the approach was also noted in local, often informal organizations. The 1995 study referred to increased involvement of farmers in local groups such as producer associations, agricultural study groups, community committees, or groups of villagers to protect communal forests from loggers or from corrupt municipal officials (Bunch and López 1995). The villagers were continuing to organize themselves to improve their situation without support from outside.

Summary of lessons learned
Lessons drawn by the documents
The Cantarranas program highlighted the importance of local ownership of the experimentation and the "we did it ourselves" feeling of the villagers. It regarded the community-based farmer-to-farmer extension approach as more efficient and less costly than extension approaches using outside professionals. The experimentation itself is crucial in that it reinforces farmers' constant efforts to seek solutions to their problems. Giving exact specifications for new technologies reduces the space for farmers to experiment and thus to own the innovation; it is therefore important to maintain flexibility in dealing with new technologies. Through experimentation, farmers learn about how technologies can function or can be adapted to do so in their specific environment and can then easily teach the essence of these technologies to others. The farmer-experimenter approach encourages farmers to develop and adapt new technologies to their needs now and in the future.

The farmer-experimenter approach can speed up and intensify the process of agricultural innovation, as it helps smallholder farmers to learn: i) how to do simple experimentation; ii) basic principles about soils and agriculture so that they can orient their experiments in useful directions; and iii) how to share results with other farmers. The approach also motivates them to continue doing this. A key challenge for a farmer-experimenter program is to choose a few technologies to start off with that will motivate farmers to try them out and see quick success — positive reinforcement — and thus become engaged in a more systematic process of innovation. They will then continue doing what brings them satisfaction, which — in agriculture — is usually related to increased yields, decreased costs, decreased risks or some combination of these.

Most of the low-cost and low-risk technologies developed by farmers on their own are not easily recognized by other farmers or by the staff of formal research and development organizations. Smallholder farmers are capable of developing innovative and valuable agroecological technology, but, if these ideas are to be widely shared, many more organizations need to train and assist farmers not only in further developing their technologies but also in disseminating them.

Lessons drawn by the study team

The farmer-experimenter approach — according to impact studies done by people closely involved in developing the approach — leads to substantial long-term impact in terms of farmers' increased capacity to investigate, experiment and share knowledge directly with other farmers. It appears to be difficult to scale up the systematic farmer-experimentation activities beyond the farmers who were originally trained by the projects to be farmer-experimenters. Impact methods still need to be developed or refined that can provide evidence about impact of project approaches on local organizational development and on local capacities to innovate and adapt.

More attention needs to be given to mechanisms that would stimulate the spread of farmer-developed technologies and of a farmer-experimentation approach beyond the direct personal contact of one farmer with another. At the time of the 1999–2001 study, Bunch and Canas thought it would be necessary to make a small but sustainable source of funding available to farmer-experimenters so that they could physically travel, meet other farmers and spread their technologies (Bunch and Canas 2001). With new communication channels now available — and even with the older ones that were already available then, such as radio and films — the need for face-to-face communication may not be as great as it was 15 years ago. New channels should be explored for farmers to share their research experiences and results within their countries and regions.

Sources of information and data

As in the case study on *Campesino a Campesino*, which builds on this case, the description and the assessment come from the perspective of primarily one person — here, Roland Bunch.

Personal communication with persons directly involved

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Case 5: Farmer participatory research in Tanzania

Introduction

From the late 1990s to around 2010, farmer participatory research (FPR) was a central component in the work of FARM–Africa,[17] an international NGO with a head office in the UK that works with rural communities in several African countries. The impact of its work in Tanzania is relatively well documented.

In 1990, FARM–Africa Tanzania started to include FPR in the crop-improvement component of the Babati Agricultural Development Project. By 2000, it was supporting this approach in all five wards of the Bashnet Division of Babati District. A major activity consisted of on-farm trials with improved varieties of beans and maize in order to address crop diseases and low yields, which had been identified by local smallholder farmers as key constraints.

In 2000, based on the success of this work and demand from farmer groups, FARM–Africa incorporated FPR into its work throughout the Babati District as one of five core components of the new Babati Rural Development Project, which continued operating until 2007. The other four components of the project were village development planning, animal health, dairy goat development, and dissemination. The total project budget amounted to EUR 1,444,073, financed largely by the EU, with the rest of the funds from the Netherlands-based NGO Cordaid.

Theory of change. The basic theory of change that emerges from the documents seems to be that creating and increasing the number of farmer research groups will catalyze farmer-led testing of a wide range of possible improvements in the cropping system, leading to identification of most feasible options, which will then rapidly spread through informal as well as organized farmer-

to-farmer extension and will thus improve livelihoods. At a higher level, the project hoped to "contribute to poverty alleviation in Tanzania through effective local partnerships, to develop replicable community-based approaches for improving agricultural productivity and sustainable land use in Babati District, and to promote these approaches and models to communities, government, districts and organisations" (Ejigu 2006).

Approach and process

The FPR process from 2000 onward, which is the focus of this case study, was more farmer-led than in the years before and had the following central features:

- Farmers identified the problems and issues to work on, initially through PRA activities facilitated by FARM–Africa; in subsequent years, farmer groups that emerged during the farmer-led research process gradually took on responsibility for annual planning and implementation.
- Farmer research groups were the key actors in the process. These groups were formed as an outcome of the PRA for village development planning. At a village meeting, usually 12 individuals — six men and six women — were selected for the group, but in practice there were often more members. The criteria for selecting members were representation of subvillages, gender balance, research interest, and willingness to share results with others. In the impact assessment, Ejigu (2006) notes that socio-economic status was not considered in selecting farmer research group members.
- The annual cycle of activities hinged on preparation of an annual plan by the farmer research group. Usually, the cycle included the design and implementation of experiments on the farms of group members. These were often supported through learning visits to other groups, as well as focused capacity-building activities provided by FARM–Africa on agricultural technologies, group functioning and the farmer-led research process. Results of the experiments were shared within the group and disseminated more widely through exchange visits and field days to demonstration plots of group members.
- The available documents do not describe how the experiments were designed or how the monitoring, evaluation and analysis tasks were handled and shared between farmers and project staff. The general narration in the documents suggests that the trials always included the testing of an innovative practice compared with a control — common practice in the area — and replication of the trial was achieved by including several members of the farmer research group in the trial.
- The groups received at least part of the materials needed for the trials, including seed and other inputs, free of charge from the project.

Most of the innovations tested by the groups included technologies and practices suggested by FARM–Africa; however, in a few cases, farmers' own innovations and ideas were also included in the trials.

The number of active farmer research groups increased from 11 in 2002 to 24 by 2007, with a total membership of 425 farmers, 45 percent of whom were women.

Institutional arrangements and context

The FPR activities were part of a FARM–Africa project, which coordinated all the work and sought the involvement of other organizations in specific project activities. The closest and most regular collaboration was with the village extension officers under the district council. Most of them joined the work with farmer research groups in their areas but do not appear to have played a lead role. Collaboration with other organizations, such as in research and marketing, focused on specific activities as discussed below.

While the FPR continued and started to show promising results, the farmer groups identified new — often institutional — issues to be addressed to reach wider impact, such as access to affordable seed, access to markets, and capacity of farmers to hire labor for soil and water conservation work. In 2004, groups that had found composite maize varieties most suitable for their areas said that

they could neither access nor afford sufficient improved seed. With support from the Tanzania Official Seed Certification Institute, nine farmer research groups set up seed multiplication plots for composite maize and bean varieties; seven groups were reported as successful by 2006. Three groups focused on potato seed production, and were reported to be struggling in 2006. FARM–Africa supported three farmer research groups that were involved in seed multiplication to establish and operate input-supply shops. These shops initially sold only seeds, but later offered other agricultural inputs.

In 2004, FARM–Africa introduced savings and credit activities for the farmer research groups and, by 2007, about half of the groups had become active savings and credit cooperative societies. The project reviewed the impact of this work with cooperative societies, which were built up through farmer research groups. However, because the societies were organized as a separate area of the project's work with its own focused set of activities, the impacts of that work are not included as part of the impacts of the FPR approach in this case. Nevertheless, the fact that the savings and credit cooperative approach was introduced can be partly attributed to the farmer research groups' analysis of bottlenecks and their demands for this type of support.

In June 2004, FARM–Africa started to address issues of market access by linking farmers with Multiflower Seeds, which supported farmers' on-farm trials with imported vegetable seeds, as well as training, field days and prizes. Other important linkages created for farmers and the relevant extension officers and government district staff included those with the Selian Agricultural Research Centre for training farmers, the Tanzania Official Seed Certification Institute for seed certification and the Arusha Foundation Seed Farm for seed supply.

Impact

The information on outcomes and impact of FARM–Africa's FPR approach is summarized below, drawing mainly from the reports on an external (Ejigu 2006) and an internal review (Ewbank et al. 2007).

Findings from the farmer-led research

In the project's meetings with farmer research groups for participatory monitoring and evaluation, farmers said the composite maize varieties such as Kilimo and Ukiriguru Composite A (UCA) used in the farmers' trials gave much higher yields than local varieties using the same cultivation practices, which included use of farm manure and improved spacing (Figure 1). Project data collected from the farmers' trials confirmed this. In all years between 2000 and 2004, the Kilimo and UCA yields were more than double those of local varieties; this was more than enough to compensate for the cost of the seeds, which was about US$ 10 per acre at the time. The farmer-led research also gave the farmers a good understanding of the relative performance of introduced bean varieties — 35–79 percent yield increase for two varieties tested.

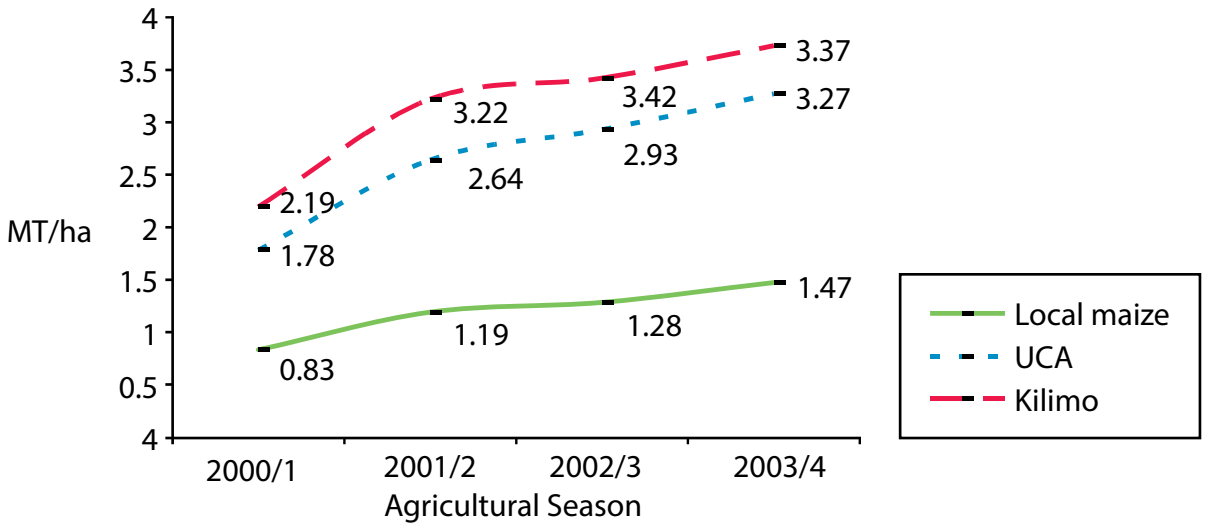

Figure 1. Composite maize yields versus local maize yields (Ewbank et al. 2007).

In the farmers' trials, using improved maize seed with i) liquid fertilizer and crop residues, ii) farmyard manure only, and iii) terracing and farmyard manure led to yield increases of 9 percent, 32 percent and 47 percent, as compared to traditional cultivation practices. The project concluded that the highest gains could be realized by addressing the issue of seed quality. The fact that farmers involved in the farmer research groups and other farmers learning from them gradually expanded the proportion of their land under improved practices from 10–15 percent in Year 1 to 50–60 percent in Year 4 indicated that the farmers saw the findings from the trials as relevant and applicable. The external impact assessment reported that adoption of improved varieties and practices was higher among men than women in the farmer research groups, but did not provide an explanation for this difference (Ejigu 2006).

The findings from the farmers' trials were shared mostly among the members of the farmer research groups and their farming peers. The impact assessment by Ejigu (2006) found that farmers understood very well the various technologies being tested and the reasons why some were better than others. Government extensionists in a stakeholder workshop in 2006 recommended to "[d]isseminate research findings in different forms — leaflets, brochures, etc." and "[e]xtract more data from the 3–5 years of project experience in FPR." This suggests that the farmer research groups could have done more to spread their findings to a wider audience. FARM–Africa's Working Paper 11 (Ewbank et al. 2007) is the most visual in terms of documentation of the project's findings disseminated at international level. In-depth analysis of data derived from the farmers' trials seems to be limited to publications at this level.

Impact on farmers' livelihoods

According to qualitative participatory monitoring and evaluation with the farmer research groups, the farmers directly involved in the research activities reported considerable increases in household income. They mentioned an increased ability to meet school costs, improvements to housing, and the purchase of dairy goats and cows, radios, mobile phones and bicycles. There was no further quantification of these statements.

A detailed study of the returns gained by 46 members of farmer research groups who were growing hybrid maize compared to those growing local maize varieties indicated the following:

1. When valuing labor at the level of costs of hired labor, using hybrid maize seed had a gross margin per acre of US$ 50; composite maize and local maize gave negative results of US$ 7.50 and US$ 24 per acre, respectively. In other words, in monetary terms, farmers using local maize seed earned less per hour than if they had worked as laborers — assuming paid labor jobs would be available.

2. Realizing that opportunity costs of labor locally may be low, the project studied how much farmers would earn per day from growing maize in the different cases. The return to labor was 1.6–2.7 times higher for farmers using hybrid maize seed as compared to those using local varieties (see Table 1).

Maize seed used	Gross margin (US$/acre)	Return to labor (US$/day)
Local	- 24.00	0.7
Composite	-7.50	1.2
Hybrid	50.00	2.0

Table 1. Return to labor from growing different types of maize seed (Ewbank et al. 2007).

A similar analysis was done on the results of the farmers' trials with horticultural crops, with seeds and technical training obtained through Multiflower Seeds. This analysis suggested considerable economic benefits, as shown in Table 2, based on data from an unknown number of farmers.

Crop	Gross margin (US$/acre[18])	Return to labor (US$/day)
Tomato	920	10
Cabbage	1,240	5
Chinese cabbage	190	2.9
Carrots	850	9.5
Water spinach	380	5.6

Table 2. Return to labor from growing different horticultural crops (Ewbank et al. 2007).

The project found that, in practice, most farmers who did research on horticultural crops ended up cultivating only 0.05–0.1 acres of these crops, indicating that other factors than gross margin and return to labor influence farmers' decisions on whether to grow horticultural crops instead of maize.

The project and the farmer groups gave deliberate attention to disseminating the results of their research findings to other farmers. However, data on the extent to which these efforts were successful are not conclusive. The external impact assessment (Ejigu 2006) indicated a limited spread of the tested practices and regarded the costs of applying them to be the main constraint to wider adoption. This assessment was based on data from intensive interaction in three villages only. Feedback from a series of discussions with farmer research groups as part of the internal project review (Ewbank et al. 2007) revealed that about 60 percent of farming families in the villages followed most of the innovations that the farmer researchers had found to work best; in Babati District, this implied 160 households per village. Thus, at the time of the assessment in 2006, a total of nearly 4,000 farmers would have changed at least some of their farming practices as a result of the FPR process. It was not possible, in the context of this desk study, to further analyze the reasons for the seemingly contradictory findings of the two assessments. No information was available about the extent to which the findings became known beyond the project area and were applied by farmers elsewhere.

Through focus group discussions with 40 resource-poor farmers, the external impact assessment examined the socio-economic status of farmers who applied the farmers' research findings. Although everyone knew about the FPR, only two of the 40 resource-poor farmers applied some of the practices coming out of the research. According to some of them, the main constraints for taking up these practices were lack of money to buy inputs such as seeds, lack of cattle for manure, and inability to meet the labor demands for soil conservation work. Others mentioned that they had hesitated to join the farmer research groups in the beginning for various reasons but, after having seen the results, were now more willing to take part.

Enhanced local capacity to innovate

According to the external impact assessment (Ejigu 2006), farmers with longer-term involvement in FPR showed great confidence in sharing experiences and in advising and training others on technologies and practices that they had tested.

The project did a participatory review of the strengths of the farmer research groups, a potentially important feature of the local capacity to continue to innovate (Ewbank et al. 2007). It found that most of the groups demonstrated characteristics of good management, including regular meetings, elected officials with clear understanding of the duration of their duties, elections every three years to renew a third of the committee, and records on group activities from which they could readily report group progress and statistics at group discussions. To what extent

these good practices continued after the project ended is not documented. In 2007, the farmer research groups emphasized the benefits they had gained in terms of learning about agricultural technologies, mentioning farm budgeting and group management.

Table 3 shows the strengths and weaknesses of the farmer research groups reported by the farmers that assessed the functioning of their own groups.

Strengths	Weaknesses
Good leadership	Sustainability of research work
Good integration with extension staff	FPR results not disseminated to farmers as widely as they could be
Exchange visits that strengthened the group	Lack of networking with other groups and experts
Capacity to manage input shop	

Table 3. Strengths and weaknesses of the farmer research groups (Ewbank et al. 2007).

Involvement of women in the farmer research groups was relatively high: 45 percent of the members on average. Surprisingly, this dropped to 33 percent in the savings and credit cooperative societies that grew out of these research groups. The documentation gives no reason for this.

All reports stress the importance of the improved linkages with resource organizations created through the FPR. These include direct links of farmers with providers of good seed from as far as Arusha. Farmer research groups mentioned that they were also able to negotiate with wholesalers to obtain seed on credit to be paid back only after 60 days, as the groups had gained a reputation of being reliable customers. One group reported as a project impact the fact that four members had purchased mobile phones and used them to order good seed, which was packed and sent by bus to them from the district town. Other important linkages created or improved through the process included those with the government research station for training on seed multiplication and with the district extension officers.

Impact on formal and informal research and development organizations

As a means of convincing others to apply the FPR approach, FARM–Africa undertook a detailed analysis of the costs and benefits of the approach. It analyzed the costs of using the approach if taken by the district government in terms of the benefits gained through working with 12 farmer research groups over a period of 12 years. The benefits were estimated based on actual application of improved practices in the project area. Making the best possible assumptions that are always needed for such analyses, such as about inflation rates and interest fluctuations, the project found an internal rate of return on investment for FPR of 55 percent, which it regarded as high. Using the approach would lead to US$ 25,000 net present value per village (Ewbank et al. 2007). The calculations have been well documented and can be verified in detail, if needed.

The project involved district extension staff as much as possible in the work, and many of them reported that they used both findings from the FPR process and experienced farmers in their extension work. Although the overall vision of the project was to develop community-based approaches and promote these among others within the governmental institutions, there does not seem to have been a systematic effort to integrate the approach into the extension work of the district council, the most obvious choice of organization for mainstreaming FPR in this case. A stakeholder workshop in 2006 reviewed the results of the FPR, discussed the possibilities of integrating it into the district extension work, and recommended that the district government should integrate the best part of the approach with a farmer field school (FFS) approach — possibly referring to the farmer research groups — into the district group-based extension system operating at the time. Ejigu (2006) concluded that "the project phased out before FPR activities were taken on board by the district extension system."

Summary of lessons learned

The FPR approach, working through carefully formed and facilitated farmer research groups, led to a growing network of farmer groups trying out innovations to ascertain their local relevance. This supports the project's theory of change.

The open nature of the approach allowed the project and the farmers involved to identify and to address important institutional constraints that prevented wider spread of the findings from the experiments. This led to important new activities that helped overcome these constraints. The fact that the FPR focused on new technologies and practices proposed by the project revealed these institutional barriers, as opposed to research focusing on farmers' own innovations and ideas that primarily use locally available resources.

The FPR approach did not reach the very poor in the project area because of the lack of attention to socio-economic differentiation when forming the farmer research groups and the testing of innovations that the very poor could not afford. Those who were reached by the project fell into the category of "resource-poor" farmers.

All reports suggest that linking farmers with a wide range of relevant resource organizations has been a key contribution of the approach. Farmers interviewed often mention this, too. This is a task that the district government could take up.

The impact studies do not give any attention to the spread of the innovations successfully tested by the farmer researchers beyond the project villages. This is a major omission, as such spread would confirm the wider relevance of these technologies. The spread is likely to be constrained by the same institutional challenges that the farmer research groups identified and addressed.

This project successfully summarized and analyzed the information and data generated by a large number of farmers' trials, allowing for wider sharing of the results and lessons. However, such data aggregation and analysis at project level limits the possibilities of feeding back the aggregated results and findings to the individual farmers and groups that carried out the on-farm trials.

Sources of information and data

Project or NGO documents

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External evaluation report

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Externally published by persons directly involved

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Case 6: Smallholder action research in Burkina Faso

Introduction

The Diobass approach centers around action research by small-scale family farmers (*recherche action paysanne* or RAP). It involves working with action-research groups (*groupes de recherche-action*) to investigate issues of crop husbandry, soil fertility management, pest and disease management, animal health and nutrition, natural resource management (especially water management), agricultural marketing and much more. The approach was initiated in 1985 in Kivu, Democratic Republic of the Congo (DRC), using the concept of *brigades de recherche-action paysanne* (Mapatano 1997). The term *brigades* was dropped because of its military connotation and replaced by *groupes*. In the past 30 years, the Belgium-based Diobass Association has promoted this approach in Burkina Faso, Cameron, Chad, DRC, Ivory Coast and Senegal. This case focuses on the work in Burkina Faso.

The Diobass approach was introduced to Burkina Faso in 1990 by the *Association Internationale Diobass Écologie et Société* (International Association Diobass, Ecology and Society), a Belgian NGO. Since 2009, the national NGO *L'Association Diobass Écologie et Société du Burkina Faso* has continued the work up to the present day. This NGO works with community-based organizations and, to a limited extent, government extension workers. Diobass is a network of farmer associations, action-research groups and resource persons who collaborate in farmer-led action research with the aim of contributing to improving the living conditions of rural communities. The Diobass platform in Burkina Faso has three thematic groups: crop farming, livestock keeping and socio-economic issues, each with a facilitation team. The multidisciplinary Diobass team in Burkina Faso accompanies the platform and the action-research groups, and is responsible for linking with research institutes and policy-lobbying groups. The team consists of five male professionals and one female professional, who has a key position as director of programs.

For the period 2008–2010, Diobass Burkina Faso received EUR 740,000 from Misereor via the *Katholische Zentralsstelle für Entwicklungshilfe* or "Catholic Central Agency for Development Aid" in Germany and from Broederlijk Delen and Oxfam Solidarité in Belgium. For the period 2011–2013, it received EUR 685,000 from *Katholische Zentralsstelle für Entwicklungshilfe* and Broederlijk Delen. At the time of the 2011 external evaluation (Paulus and Mongbo 2012), the Diobass Burkina Faso team was facilitating the research of 70 farmer research groups at four different stages of research (starting, in midst of experiment, finalizing experiment, independent), of which 35 were being funded. Each action-research group has about 15 members, making a total of 1,050 farmers directly involved in the experimentation at that point in time. They form part of a Diobass Burkina Faso network of 1,668 community-based organizations in 1,263 villages, with a total of more than 53,000 members in nine provinces, whom the Diobass team regarded as indirect beneficiaries. However, for its calculations of efficiency, the evaluation team used only half this number. A total of 38 farmer organizations are registered as members of the network; they set up and manage the action-research groups. According to the 2012 Diobass Burkina Faso report, 23 innovations developed by about 60 action-research groups have spread to 32,551 farmers through the 38 farmer organizations, compared to 24,500 farmers in 2011, which means an increase of 30 percent within a year. A total of 13 products were validated and four were still under experimentation; 22 action-research groups were reported to be financially autonomous, compared to 13 in 2011.

Diobass Burkina Faso regards networking with like-minded organizations to be important for its work. Therefore, in 2012, the team took part in two formal NGO coordination initiatives: the CNCD-11.11.11 Platform for Central Africa and the Agri-Congo Alliance, a consortium of Belgium NGOs such as Solidarité Socialiste, Oxfam and SOS Faim that advocates and lobbies for family farming in the DRC.

Theory of change. Developing the capacities of groups of smallholder farmers to conduct research on behalf of their communities will stimulate their inherent creativity and lead to findings that respond to local problems in agriculture and the daily lives of the farmers involved and that can be applied by other small-scale farmers, thus improving their well-being at household and community level. Engagement in this Diobass-supported research will increase the farmers' capacity and

confidence to continue doing research without outside funding and to influence policymaking. This will lead to more sustainable agriculture and improved living conditions in the rural areas (see "Chaînes de causalité de Diobass," p. 56 in evaluation report).

Approach and process

The Diobass approach aims to organize farmers around themes defined by the communities according to their priority concerns, which can include crop and livestock farming but can also be in the domains of human health, environment, education and gender. It is designed to encourage farmers to reflect on their situation and to do their own research to develop locally appropriate solutions for community-identified problems, combining indigenous and introduced knowledge. It supports farmer experimentation with potential solutions or innovations in action-research groups in the different domains, and helps the farmers document and share their results.[19]

The ideal process of farmer-led action research as described in the evaluation report is as follows: The farmer organization proposes research topics to the Diobass Burkina Faso team, which then joins the farmer organization for a brief one-day diagnosis; action-research groups are formed and mandated by the farmer organization to conduct the research; the action-research groups, with Diobass support, define the objective and program of research; they present their proposals to the farmer organization and the Diobass Burkina Faso team and defend their need for resources; the team allocates funds to the action-research groups for the materials they need for their experiments; it arranges exchange visits to collect information, including local potential solutions; the action-research groups carry out the experiments to produce innovations, which are then subjected to people's validation (that is, the innovation is tried out by several users); the results of this are shared with other villagers and government extension staff; the innovations are subjected to scientific validation; and the validated ones are disseminated primarily through farmer-to-farmer extension. The role of the farmer organization is not explicit in the consulted documents. However, the Diobass team provides its support to this process only upon demand by the farmer organizations. Groups that have gone through this action-research process over a period of three years are expected to continue their research without further funding, that is, to become "independent."

The international Diobass association based in Belgium supports the sharing between country-based Diobass platforms about knowledge and methods related to farmer-led action research. Because Diobass regards itself as a network and not a project at both national and international level, it has no strategy for phasing out. Rather, its strategy is to enlarge the platform so as to promote farmer-led action research more widely. The evaluators noted that the network was indeed growing, with new farmer organizations, action-research groups and research topics each year.

Institutional arrangements and context

Diobass has a board of directors with two representatives from farmer groups or organizations, two people from research institutes and a member from a Food and Agriculture Organization (FAO) project in Burkina Faso. It has presented its approach in the Agrinovia (www.agrinovia.org) training at the University of Ouagadougou. International student interns document farmer innovations and experimentation and, to some extent, the outcomes and impacts. Diobass Burkina Faso has a partnership agreement with INERA. The *Agence Nationale de Valorisation des Résultats de la Recherche* (known as ANVAR), a government agency for putting research results into use, organizes a national innovation fair every two years, which is open also to Diobass-supported action-research groups. Diobass tries to draw extension agents into supporting the farmers' experiments, but the extent to which this happens depends on individual commitment, as Diobass does not have a formal agreement about this with the extension agency. Diobass has formal links with Réseau MARP — a francophone PRA network — and *Solidarité et Entraide Mutuelle au Sahel* and informal links with the *Office de Développement des Eglises évangélique*s, World Neighbors and *Institut Africain pour le Développement Économique et Social* ("African Institute for Economic and Social Development," known by its French acronym INADES)-Formation Burkina Faso, but exchanges little with them about the Diobass approach. In 2010, the Diobass team tried to set up a network of action-research organizations, including those just mentioned, but these organizations seemed to be very focused on their own work and did not see action research as a priority.

According to the external evaluators, the Government of Burkina Faso focuses its agricultural development efforts on value chains, entrepreneurship and agribusiness, concentrates its investments in high-potential areas, and neglects the large majority of Burkinabé family farmers (Paulus and Mongbo 2012). These have been trying to organize themselves to find their own solutions, with little support from or communication with the governmental services or administration. Diobass seeks to support these efforts of self-organizing family farmers. The governmental research and extension services have very limited means to be able to visit action-research groups and to accompany their experimentation and also do not have the mandate to do this.

Impact

Misereor commissioned the external evaluation of Diobass Burkina Faso to review the activities in 2008–2011 (Paulus and Mongbo 2012). The team comprised one female German and one male Beninois consultant, who assessed the strengths and weaknesses of the Diobass structure and approach and the effects and impacts of the activities over this period. The evaluation was based on several workshops — on launching, reflection and feedback of preliminary results — with farmer organizations, eight action-research groups in the North and on the Central Plateau, and the Diobass Burkina Faso team, as well as group discussions, individual interviews with a total of 128 farmers and resource persons, document review and observations. To avoid bias, the Diobass team did not accompany the evaluation team. The team had difficulty finding and interviewing people not belonging to the action-research groups.

Findings from the farmer-led research

Some examples of results of farmer experimentation include powder to control striga, which led to a better grain harvest, comparing treated and nontreated fields; better seed management; medication for cattle and poultry, which led to savings on drugs but also fewer losses and therefore more "savings" in terms of livestock; multimineral block for livestock; and a new way to conserve onions. The Diobass reports do not include data about the results of the farmers' experiments. In her synthesis of three evaluations in Burkina Faso, Mali and Senegal, Paulus (2013) mentions that there is no systematic examination of the effects or risks of the technologies tested.

The evaluation team noted that, because the focus is on endogenous innovation development, some action-research groups could not find solutions to problems that demand more knowledge than they have at their level (Paulus and Mongbo 2012). The Diobass approach is internally oriented on the microlevel, with weak external links.

Each year, Diobass organizes two thematic workshops in a specific village — for example, on food security, land tenure or climate change — for purposes of both training and knowledge exchange. These meetings are often occasions for identifying new research topics. Each workshop is attended by 80–100 people, including people from government agencies and the local administration. In addition, the Diobass team helps local representatives of farmer organizations to organize village-level "knowledge fairs" where the action-research groups present their findings. These fairs also attract people from neighboring villages. Informal farmer-to-farmer dissemination also takes place within the villages. Other tools used for learning and sharing are information visits, leaflets published by the farmers and radio programs. The farmer organizations also invite individuals and groups to come together to learn from their peers in training sessions without the presence of Diobass staff. However, the training methods of the team and of farmer-trainers tended toward merely disseminating information.

The evaluation team found that the topics of farmers' research were numerous — almost 300 innovations were tested — and very diverse, making monitoring and evaluation difficult. The small Diobass team in Burkina Faso could not closely accompany the large number of action-research groups. The monitoring and evaluation system gave no attention to learning about and improving the action-research process and little attention to outcomes and impacts of the process.

The evaluation team calculated that, on the basis of project costs in 2008–2010, a total of about EUR 21,000 was spent per action-research group — the direct beneficiaries — and about EUR 45 per indirect beneficiary over the three years.[20] The team regarded this as justified, compared with the amounts invested in formal agricultural research that did not produce innovations that were as useful for smallholders as did the action-research groups. It pointed out that the costs of the groups were somewhat lower than those of FFSs.[21]

Impact on farmers' livelihoods

The evaluation team found that the Diobass approach brought clear and positive changes for both men and women farmers in both economic and social terms. The farmer-led action research responded effectively to the main problems of the farming communities involved. Even if not all socio-economic and technical problems could be solved with the approach, it took farmers' concerns seriously. The biggest positive impact was in terms of the farmers' increased confidence — particularly in the case of the women, who developed new ideas about how to generate additional income. In 1996, about 10 percent of the women were engaged in income-generating activities; by 2011, this was 90 percent, which the women attributed to the Diobass approach. They now depend less on their husbands for cash and can use their own money to send children to school.

According to the action-research group members, the sale of agricultural products using the results of their experimentation related to crops, livestock and trees raised their household incomes. For example, farmers reported that the improved onion storage led to an average of 70 percent increase in their income from selling onions, which they could sell at a time of year before the cereal crops could be harvested and thus could obtain cash to buy food and pay school fees. One action-research group had used the income from their joint plot to cover operational expenses of the farmer organization, for example, to take part in meetings outside the village. Reports on studies by university students revealed similarly positive impacts of other locally developed technologies such as the multinutritional block for livestock. The evaluation team assessed the technologies coming out of the farmer-led action research to be "sustainable" in the sense of not having a negative effect on the environment, but had doubts about the sustainability of the Diobass approach without external support.

The evaluation team raised the issue of intellectual property rights, as the farmers' research is being paid out of public resources yet a few of the action-research groups kept their results to themselves because they wanted to reap private profit. This issue had not been addressed within the Diobass network. Although the evaluation did not directly address issues of equity between richer and poorer members of the community, it did raise the question whether the benefits obtained by the farmer-experimenters were being shared equitably. About 33 percent of the farmers involved in the research and 43 percent of the farmers involved in related training activities were women. Involvement of youth is not mentioned in the reports from Diobass Burkina Faso, but there are specific activities involving youth and microenterprises in Diobass Kivu (Diobass 2013).

Enhanced local capacity to innovate

The members of the action-research groups gained greater confidence, knowledge and skills in carrying out experiments, but their links with support organizations or other external sources of knowledge were only marginally improved. The evaluators found the major outcomes to be in terms of learning and social transformation. The Diobass approach led farmers to reflect, take action and gain more confidence in their own capacities. The action-research group members, both men and women, regarded themselves as "farmer-researchers," "farmer-evaluators" and "farmer-trainers." Women were strongly engaged in the activities and, as a result, their status in the community improved. The women said they had gained confidence to take part in public discussions in the community and also with outsiders. The farmers were proud that their knowledge was being recognized by others. According to the evaluators, "research" has been demystified in the farming community. The farmers felt that they were advancing more quickly with the Diobass approach than with the government services that, according to the action-research groups, still did not give them much support.

The evaluators found a dynamic learning process underway at farmer level. Farmers were gradually improving their practices; were becoming more creative, more independent and more aware of their own worth; and greatly appreciated the exchange within and between the action-research groups. The evaluators found a "community" of action-research groups learning from each other and starting to attract the interest of research scientists. The group members had become better able to experiment with potential solutions. However, these positive effects concerned only a relatively small number of people in the community. The evaluators did not find objective indicators that the effects went much beyond the action-research groups. The findings of the farmer-researchers had not been validated by formal science and given a "quality label," which would raise the confidence of other farmers in other areas to apply them. Moreover, some farmers were disseminating information — for example, regarding pest and disease management — even though there might be negative side effects, but neither the action-research groups nor research scientists had looked into this.

Most of the older and "independent" groups — that is, no longer receiving direct support through Diobass — focused on applying, and in some cases disseminating, the results of their earlier research. Only a few of them continued to do research together as a group or to support younger groups in the research process. The assumption of Diobass that the action-research groups would continue without external funding was not confirmed. Three years of accompanying such a group did not seem to be enough for it to attain this level of independence. Moreover, the farmer organizations that were supposed to be coordinating the thematic subgroups and action-research groups did not yet have the capacity to do this on their own. According to the evaluators, the work of Diobass in Burkina Faso, which started 25 years ago, cannot be continued without external support, because the costs of farmers' research — in the way it is supported by Diobass — cannot be covered out of local means. However, the evaluators felt it was essential to continue supporting this grassroots-level agricultural improvement, because the government services are not doing so.

The evaluators noted some hesitancy on the part of Diobass Burkina Faso to make any changes in the "pure" Diobass approach originally introduced from Belgium. This prevented the network from opening up to innovative methods that might enrich the approach and from collaborating more closely with other organizations that would have the potential to contribute to the work of the action-research groups.

Impact on formal and informal research and development organizations

The Diobass approach in its ideal form is well documented in guidelines for the facilitators, but there is little documentation of or critical reflection on how the approach is applied in practice. For this reason, the evaluators saw little contribution of this work to national and international discussions about agricultural research and development. Because there has been very limited involvement of formal research in the Diobass work, the findings of the action-research groups have not been scientifically validated and disseminated through the extension service. The Diobass approach of supporting action-research groups has not been internalized into the regular work of governmental research and extension organizations in Burkina Faso, and it still depends on external funding.

The linkages of the Diobass network of farmer-researchers with other actors in agricultural research and development were weak and, where they existed, were generally only on the individual and informal level. Although the research topics were relevant for smallholders and addressed their real problems and needs, Diobass was not well enough known among formal researchers in Burkina Faso for the approach and results of its work to be widely recognized. The Diobass approach was also not well known in other government agencies and NGOs.

Only two farmer organizations had integrated farmer-led action research into their regular activities. Some farmer organizations had, with Diobass support, become more active in influencing policy, mainly around land rights and genetically modified organisms, but not about approaches to agricultural research and development.

Summary of lessons learned

Lessons drawn by the documents

The NGOs and farmers involved in the farmer-led research should reflect on the approach and process they are taking so that they can improve how they organize and conduct the research, verify the findings more carefully, and share the results more widely. In areas like rural Burkina Faso with a low level of literacy among farmers, more attention needs to be given to developing learning tools and processes suitable for illiterate adults. The NGO supporting the farmer-led research process needs to critically assess how it accompanies the farmer-researchers — the length and intensity of accompaniment, and the funding provided — to be able to improve its support. It should be open to other approaches to farmer-led research and recognize what it can learn from them. A diversity of participants in the innovation process and contact with the external world, which the external evaluators found to be missing in the Diobass work in Burkina Faso, are important to bring in diverse perspectives on reality and to widen the scope of local innovation.

The farmers' research should be presented in a form attractive to other farmers but also in a systematic way so that it attracts the interest of new technical and financial partners, including research scientists. A better classification of the topics of the farmers' research would permit thematic monitoring and evaluation for internal and external learning. This would help strengthen relations with other NGOs and with research and extension agencies so that the farmer-researchers receive better technical support and their findings are better used.

Diobass did not yet address the issue of protection of intellectual property rights — whether and, if so, how this could be achieved — and should do so.

Although the Diobass approach seeks minimal external funding and intervention — and also clearly refuses to become an NGO — the current rural development context is strongly oriented to management based on the project cycle, which constrains the creativity of the Diobass partners in taking a reflective and strategic approach in trying to sustain and upscale farmer-led action research in Burkina Faso without external funding. This raises the question of whether it is even possible to go beyond localized activities and really upscale a farmer-led action-research approach without external funding.

Lessons drawn by the study team

Introduced approaches to stimulating and facilitating farmer-led research need to be locally adapted in each country and constantly improved through critical reflection; it is for this reason that good systems of participatory monitoring and evaluation are needed. It would be useful to compare the effectiveness of the same approach in different countries, which could help to make more clear the strengths and challenges of the approach in different institutional and policy settings.

Farmer innovation fairs, or "symposia of farmer-experimenters" — used also in the *Campesino a Campesino* approach in Nicaragua (Case 7) — are valuable tools for motivating farmers to innovate as well as for sharing knowledge from farmer to farmer. During such fairs, attention should be given not only to the farmer innovations but also to the process of joint experimentation, the way different actors experience the collaboration, and how the processes and outcomes are documented and shared.

Social, economic and organizational innovations, such as new ways of marketing or handling resource-use conflicts, are often not easily visible, require inclusion of several actors in the community and possibly beyond, rather than only individual innovators, and are more difficult to subject to "joint experimentation." This is probably one reason why most farmer-led research promoters take the simpler route of supporting joint experimentation on technologies. Moreover, joint investigation of "soft" innovations requires involvement of social scientists willing to spend time with the rural community or group to support an action-reflection-learning-action process to assess and improve the innovation.

The social capital — motivation, networking capacity, trust and ownership — surrounding the organization that promotes the farmer-led research approach is a key factor for its success.

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Case 7: Participatory innovation development in Mali

Introduction
Promoting Farmer Experimentation and Innovation in the Sahel (PROFEIS) started in 2006 in West Africa as an action-research program to promote farmer innovation and participatory innovation development (PID). It seeks to embed agricultural research and extension activities within rural communities in a way that enables a constructive exchange of experiences and knowledge between farmers, extension agents and formal researchers. PROFEIS was designed to be carried out in Mali, Niger and Senegal (IED Afrique 2005) as a francophone initiative under the umbrella of the NGO-coordinated multistakeholder international network PROLINNOVA, which stands for "PROmoting Local INNOVAtion in ecologically oriented agriculture and natural resource management." PROFEIS expected to achieve the following:

- Better availability of appropriate and low-cost innovations to resource-poor farmers.
- Improved agricultural production, resource conservation and biodiversity by applying various effective and innovative practices that can be easily practiced by resource-poor farmers.
- Integration of the PID approach into the policies and structures of formal institutions of agricultural research, development and education.

PROFEIS–Mali has received financial support from Misereor in Germany through the *Katholische Zentralstelle für Entwicklungshilfe* for Phase 1 (EUR 125,000 for 2006–2009) and Phase 2 (EUR 128,000 for 2010–2013) and is now in Phase 3 (EUR 390,000 for 2014–2016).

The *Association pour le Développement des Activités de Production et de Formation* (ADAF-Gallè) or "Association for Development of Production and Training Activities" — one of the first women's NGOs in Mali — coordinates the small multistakeholder steering group of PROFEIS–Mali, made up of three members: the NGO ADAF-Gallè, the farmer organization *Association des Organisations Professionnelles Paysannes* (AOPP) or "Association of Professional Smallholder Organizations," and the *Institut d'Économie Rurale* (IER) or "Rural Economy Institute." This group meets about once a month to plan activities. ADAF-Gallè handles the administrative and financial management and builds and nurtures relations with decision-makers in formal structures of research, extension and education, in addition to facilitating specific multi-actor partnerships in PID on the ground. AOPP arranges the practical fieldwork through intermediaries in its regional offices in Ségou and Mopti, the two districts where PROFEIS–Mali is operating on the ground. IER provides training and helps farmers design their experiments; scientists in the research stations closest to the experimenting farmers are responsible for monitoring the joint experiments. In each district, a local NGO is involved in the work. In addition to the work at field level, PROFEIS–Mali engages in policy dialogue at national level.

External support is given to PROFEIS–Mali by two advisors in the PID approach and methodology — one Senegalese man from ETC Foundation in the Netherlands, now an independent advisor based in Belgium, and one Senegalese man from *Innovation, Environnement, Développement Afrique* (known as IED–Afrique) based in Senegal. These two backstoppers have given training and coaching support in Mali and from a distance by email and Skype, supported internal reflection on the farmer-led research experiences, and facilitated linkages with multistakeholder PROLINNOVA platforms in other countries in Africa, Asia and Latin America that follow a similar approach. The female Malian director of the coordinating NGO, ADAF–Gallè, also maintains good links with research organizations in Mali and West Africa.

Wider context. About 70 percent of the active population in Mali works in the agricultural sector (Stads and Maiga 2011). Over several decades, efforts by the Government of Mali to improve agricultural productivity and production have followed a "modernization" approach through mechanization, monocropping and high use of external inputs. Most of the introduced technologies transferred from research through extension workers to farmers were and are not suitable for resource-poor smallholder farmers, who make up the majority of the rural population. The *Loi d'orientation agricole* of 2006 aimed to guarantee Mali's self-sufficiency in food and make agriculture the driving force of the national economy. However, the formal agricultural research system in Mali depends very heavily on external donors; this makes it highly vulnerable and subject to large variations in funding (Stads and Maiga 2011). The recent political upheavals and conflicts in Mali have made it more difficult for research and development staff in both the governmental and the CSO sector to engage in activities in the field, especially in the middle and north of the country.

Theory of change. Recognizing smallholder farmers' own experimentation and innovation helps the farmers and other research and development actors appreciate the local capacities and potentials, increases the farmers' self-confidence, reveals issues of local priority, and offers a good starting point for joint experimentation by farmers and others to develop or adapt appropriate innovations. This experience of co-research strengthens the linkages and understanding between the smallholder farmers and the other actors and makes them better able to continue to interact in adapting to change and capturing new opportunities. Integrating this approach into farmer organizations as well as into governmental institutions of agricultural research, extension and education will lead to acceleration and expansion of dynamic innovation and adaptation processes that are key for sustainable farming systems and rural livelihoods. Providing evidence of how this approach works on the ground will strengthen the lobbying message of the people trying to institutionalize this approach.

Approach and process

The PID approach is meant to strengthen partnerships between farmer innovators, farmer groups and organizations, NGOs, governmental development agents, and research scientists in joint experimentation focused on priority topics of smallholder farmers. The joint experiments build on and seek to improve local innovations that are relevant for these farmers and for others living in similar agroecological areas, with the aim of contributing to food security and sustainable natural resource management. The PROFEIS team trains interested people from government agencies and NGOs working in agricultural research and development to recognize local innovation and to facilitate participatory action research and innovation. Already during the training, the participants start to identify and document local technical, social and organizational innovations. In different villages, the farmer innovators and external partners — NGO staff, researchers and extension agents — agree on specific innovations that seem to be promising and identify key questions they want to explore jointly. The smallholder farmers carry out the experiments, while the other actors support them and handle most of the monitoring, evaluation and documentation of the process and results.

In addition to facilitating joint experimentation based on local innovations, PROFEIS–Mali encourages the formation of farmer networks for mutual learning about the innovations and to disseminate the results more widely. Another set of activities focuses on embedding the approach in institutions of agricultural research, extension and education, by means of publications, training, policy dialogue, and workshops bringing researchers and extensionists together to discuss the approach and its outcomes.

The interaction of farmers, researchers and extensionists in developing locally appropriate innovations is facilitated by an NGO. This is meant to ensure that the external actors take a truly farmer-centered approach and put local knowledge on the same footing as scientific knowledge. The NGO has the task of reaching out to and linking up with relevant research and development institutions that have the expertise needed to support farmer innovators in their experimentation and dissemination activities. Together with other NGOs and partners in the steering group, the coordinating NGO tries to create favorable policy and institutional conditions for farmer-led research and development. The steering group members and other formal research and development actors directly involved in the PID activities are also expected to raise awareness and stimulate discussion about farmer innovation and participatory research among colleagues and decision-makers within their own organizations.

Impact

An external evaluation was made of PROFEIS–Mali in October 2012 (Paulus and Mongbo 2012), alongside the evaluation of two other projects supported by Misereor: PROFEIS–Senegal and Diobass in Burkina Faso (see Case 5). The evaluation in Mali lasted two weeks and was conducted by a female consultant from Germany and a male consultant from Benin. They made observations and conducted semistructured interviews and discussions with individuals and groups of innovators, other farmers, farmer organization leaders, formal researchers, extensionists, research or extension managers, and university staff — a total of 102 persons — in the capital Bamako and in Ségou District. The security situation in the second district, Mopti, was too uncertain for them to visit farmer innovators and experimenters there. The first evaluator also made a synthesis and comparison of the strengths and weaknesses of the approaches to farmer-led research and development undertaken in the three countries (Paulus 2013). The assessment in this section is based on these two reports.

The external evaluation team estimated that PROFEIS was working with about 120 farmers in joint experimentation, about one-quarter of them women, and that about 4,000 other farmers in the two districts were benefiting indirectly by learning from the work of the innovating and experimenting farmers. A secondary target group comprised an unknown number of formal researchers and extension workers who could potentially benefit; at the time of the external evaluation, five researchers, six young professionals (interns), 16 extension agents and seven university teachers were working directly with PROFEIS–Mali.

Findings from the farmer-led research

The responses of farmers, especially in the farmer organization AOPP, convinced the evaluators that the PID approach is very relevant and important and that the technologies that are coming out of the process are useful for smallholder farmers; the evaluators did not distinguish between the local innovations documented and the outputs of joint experimentation. Examples of useful innovations identified or developed included an egg incubator made of clay, a plant-based powder to control striga, biological pesticides for horticultural crops, grafting techniques, conservation of fish, and social innovations such as a village-based initiative to charge taxes on carts so as to cover the functioning costs of the local school, combined with concerted efforts by the village women to make sure that children attended school.

By the time of the evaluation, PROFEIS–Mali had identified 102 local innovations and supported 13 cases of joint experimentation designed to improve the local innovations, responding to specific questions of the farmers. Farmers kept their own records on their experiments, and external actors such as the interns also kept some records, but the data did not appear to have been systematically analyzed. The evaluators could find no precise figures on the results of the joint experiments and on the effects and impacts of the specific innovations. They found that the innovations were being disseminated mainly through informal farmer networks; this process was not systematically supported by the national extension system.

Impact on farmers' livelihoods

Because PROFEIS–Mali did not have baseline data or a well-functioning monitoring and evaluation system, the evaluators could not obtain quantitative impact data and did not have time to collect such data themselves. They therefore could not present figures on the economic impacts of the innovations. Nevertheless, on the basis of their interviews and observations, they stated that the PID approach had led to increases in yields and household incomes. They estimated that, on average, farmers who applied the innovations had increased their income by about 10 percent. These farmers included not only the local experimenters but also other farmers in the same and neighboring communities. The innovations proved to be easily accessible to resource-poor farmers, who showed keen interest in the local experiments and were quickly taking up the new ideas. The evaluators listed several positive effects of specific innovations, such as increased income from selling fruit and fruit trees after practicing a new locally developed grafting technique, successful development of a treatment using a local plant to replace the use of chemical products against lice, and successful development of an egg incubator made of local materials that cost less than one-fifth the price of an industrially produced incubator. More than 140 men and women farmers had been trained to build their own incubators, and the increased production and sale of guinea fowl generated considerable income, which the households invested in livestock and schooling. The evaluators also found that the work of PROFEIS had contributed to better human health in the villages and a higher rate of school attendance. By helping farmers develop and disseminate locally useful innovations, PROFEIS–Mali had contributed to improved living conditions in the rural areas where it was working, especially for farm families with very limited capacity to buy external inputs.

Enhanced local capacity to innovate

The evaluators found that the PID approach encouraged dialogue between the different actors in research and development and helped change the customary top-down relations between researchers and farmers into partnership relations. This led to an increase in the status and self-esteem of the men and women farmers, as they were recognized as innovators by their farming peers and by the external research and development actors. The farmers were confident about the importance of their innovations, were proud to be leading the joint experiments, and felt accepted by the formal researchers working with them. Some of them were particularly proud to have had the opportunity to present their innovations at an international meeting of PROLINNOVA partners in 2012, attended also by policy- and decision-makers from Malian research and development organizations. Women innovators felt that they were being accepted as equals by men in the village and by researchers from outside. The farmers — men and women — showed great enthusiasm for the farmer-led research approach because it values their knowledge and creativity and starts with looking at their solutions rather than

problems. Numerous farmers had approached AOPP in Ségou to ask that their innovations also be documented. The experimenting farmers were keenly interested to continue trying out new ideas and to share the results with other farmers. The evaluators found that farming communities were exchanging ideas with each other informally without project support.

The evaluators stated that the men and especially the women innovators and experimenters had, thanks to PROFEIS, not only improved their own livelihoods but also become vectors of social progress in their communities and created informal self-help networks to address nonagricultural issues as well.

No mention is made in the documents about any involvement of rural youth in the PID activities.

Impact on formal and informal research and development organizations
The evaluators reported a change in attitude of the researchers and extensionists at both national and district level who were directly involved in the PROFEIS–Mali work and who appreciated the contribution of smallholder farmers to research and development; this change in individuals was described as a first step toward institutional change. The researchers involved confirmed the usefulness of working directly with both smallholder farmers and extensionists in the field and were keen to work even more intensively in this mode. They were highly committed to the PROFEIS program. Through informal networking among professionals in the governmental research and development organizations and in the NGOs involved, news had spread within Mali about the PID approach and about particularly interesting innovations developed by smallholder farmers.

Many formal researchers in Mali expressed the view that they should be working more closely with farmers to obtain better results, but — according to the evaluators — the transfer-of-technology mode of working still prevailed. PROFEIS showed that another approach is possible, and many people in the formal research and extension system therefore showed interest in the work of PROFEIS. Thus far, however, only a few individuals within the research organizations are actively involved in the PID activities; this approach is far from being integrated within their organizations. Despite the interest that has been awakened by the approach, the evaluators felt that its great potential had not yet been exploited by the national research system in Mali, and attributed this to PROFEIS's lack of a deliberate strategy for and focused attention to institutional change in agricultural research and development.

PROFEIS–Mali has an explicit aim of bringing about such institutional change, but, thus far, it has pursued mainly the shorter-term objectives of facilitating local-level innovation and experimentation by farmers and researchers. It has not reflected in a systematic way on the concepts it is applying, how the PID approach could be improved, and the extent to which it is achieving its long-term objectives. However, although PROFEIS does not have a strategy for scaling up the approach, it does have many elements that could be used to develop such a strategy. By facilitating joint experimentation by farmers and researchers, it has been able to experiment with a multi-actor dialogue at the local level. This process, if well analyzed, would allow it to find ways to involve a larger number of researchers in PID.

In sum, the evaluators found that the PID approach, by discovering and developing useful innovations and by bringing multiple actors together in this process, was improving the livelihoods of rural people and was on the way — albeit very slowly — to bringing about a paradigm change in agricultural research and development. The evaluators felt that an important seed had been planted in Mali's research and development landscape: the idea of starting from farmers' solutions (Paulus and Mongbo 2012).

Summary of lessons learned
Lessons drawn by the documents
As motivating as the PID approach may be, it will not succeed unless the actors involved have analytical capacities, a good knowledge of participatory methodologies, and a readiness and flexibility to learn from their experience and to adjust the approach accordingly.

Although facilitating farmer-researcher partnership in joint experimentation is leading to positive localized results, the greatest added value for the lives of rural people will come from embedding the approach into institutions of agricultural research, extension and education so that it is applied throughout the country.

Broad alliances must be sought and a clear strategy developed jointly to be able to institutionalize the approach. A key alliance will be with institutions of higher learning, which can introduce the approach to a large number of future researchers and extensionists. In order to inculcate the attitudes and behavior needed to support farmer-led research, it will be important that as many students as possible have the chance to experience on-the-ground collaboration with innovative and experimenting farmers.

The multi-actor planning and learning platforms at national level need to include representatives from all the key agricultural research and development institutions, including decision-makers.

Systematic monitoring, evaluation and impact assessment, along with frequent reflection on the PID concepts, methods and processes, are essential in order to achieve the ultimate objective of institutionalizing the approach in agricultural research, extension and education.

Promoters of PID need to give more attention to issues of intellectual property rights and take a well-deliberated stand on how to deal with them.

Lessons drawn by the study team

The PID approach that builds on local innovation — starting from local solutions rather than problems — is highly motivating for smallholder farmers and encourages them to explore and develop new ways of doing things. This approach also seems to strike a chord with many individuals inside the formal agricultural research and development system, judging from the way information about the approach and the local innovations emerging from it is spreading through informal channels, including within informal professional networks. In this age of electronic communication, advantage could be taken of such informal channels to spread the ideas and enthusiasm extremely widely.

If convincing evidence is to be generated from this approach so that formal research and development institutions embrace it, much more attention must be given to the following aspects: i) designing and conducting training in an appropriate monitoring and evaluation system; ii) accompanying and documenting the implementation of the monitoring, evaluation and impact assessment; and iii) designing and pursuing strategies to bring about institutional change.

Sources of information and data

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Case 8: Local agricultural research committees (CIALs) in Honduras

Introduction

The methodology of *comités de investigación agrícola local* (CIALs), or "local agricultural research committees," was developed by CIAT. It was introduced to Honduras when Sally Humphries, a rural sociologist from the Center, arrived in the country in 1993. She hired two Honduran agronomists and set up the *Investigación Participativa en Centroamérica* (IPC) or "Participatory Research in Central America" project to promote FPR based on the CIAL methodology. Less than a year into the work, Sally Humphries left CIAT and Honduras to take up a teaching position at the University of Guelph in Canada. However, her partnership with the Honduran project staff continued, and responsibility for the project moved from CIAT to the University of Guelph. The team that led this project evolved into a local NGO — *Fundación para la Investigación Participativa con Agricultores de Honduras* (FIPAH) or "Foundation for Participatory Research with Honduran Farmers" — and was registered as a nonprofit research foundation in 2003. Currently, the technical team consists of six men and two women — seven agronomists and an agricultural economist — including the original male agronomist who started up the project and is now FIPAH's executive director, as well as 14 part-time farmer facilitators.

The work was initially funded by CIAT and later — from 1995 to 2000 — by the IDRC in Canada. After 2000, when this support ended, USC Canada started to partner with FIPAH and fund the work through its "Seeds of Survival" program, with the Canadian International Development Agency (CIDA) as back donor. FIPAH has also received support from the Norwegian Development Fund since 2007, but the bulk of the funding — around CAD 200,000 annually — comes from USC Canada.

For nearly 20 years, FIPAH has been working with hillside communities considered among the poorest in Honduras. Among the key factors for extreme poverty mentioned are farming on hilly lands prone to serious erosion and low fertility; poor communication and transportation infrastructure; distance from markets; lack of access to services, including agricultural research and extension; limited livelihood options; low levels of education; poor social organization; and marginalization of women from public participation on account of men's traditional attitudes regarding gender roles.

Within this context, FIPAH's main purpose of involving hillside communities in CIALs has been to improve food security and to conserve natural and local genetic resources, with priority given to involving women and the most marginalized people. This has been achieved through strengthening the capacities of community members, both men and women, to be farmer-researchers who address local agricultural problems. FIPAH also aimed to build human, social and financial capital within these communities by broadening the CIALs' scope to include other development activities.

Theory of change. Building the capacity of poor men and women from hillside communities to engage in research through CIALs will enable them to find solutions to local agricultural problems, which in turn will lead to improved food security. Doing experimentation that is systematic and deemed "credible" by formal research will enable the work and the research findings — such as locally bred varieties — of the CIALs to be recognized within the national agricultural research and development community.

Approach and process

According to Ashby (2000), a CIAL is a farmer-run research service answerable to the community. The CIALs experiment with locally unknown or unproven farming methods, comparing them with common practice. The CIALs arose to meet the needs of poor farming communities with little or no access to agricultural support services.

In starting its work with the communities, FIPAH followed the CIAL methodology as developed by CIAT, which is an iterative process consisting of several stages:

- **Motivation.** A facilitator invites the entire community to a meeting to introduce the idea and emphasizes that the CIAL is a community-owned and community-managed research process. The facilitator discusses local experimentation and the possibility of combining farmers' knowledge with that of outsiders. She or he explains the nature and purpose of the CIAL and invites the community to start one.
- **Election.** If interested, the community elects through secret ballot a committee of four members to do research on its behalf. The main selection criteria suggested are community-mindedness and interest in experimenting, but communities can include other criteria, such as literacy or prior experience in projects. Candidates must also be willing to be involved for at least one year and be prepared to undergo relevant training. Volunteers from within the community agree to assist the committee members.
- **Diagnosis.** The facilitator calls a second meeting for a group diagnostic process to identify an agricultural topic for research. The group considers aspects such as the chance of success, how many people the experiment would benefit and the costs involved.
- **Planning.** With the facilitator's support, the CIAL members decide on the objectives, the treatments and controls, the materials and methods to be used, the inputs needed, the data to be collected, and the criteria for evaluating results. Tasks are divided among the members.
- **Experimentation.** The CIAL members carry out the experiment, assisted by other people in the community.
- **Evaluation and analysis.** The CIAL meets with the facilitator to assess the results of the experiment, draw conclusions and lessons, and prepare for presenting the results to the community.
- **Feedback.** The CIAL presents the activities, results and expenditures related to the experiment. The community decides how to use the results of the experiment and whether the committee should continue with the experiment, switch to a new topic or cease its activities altogether.

The CIAL monitors the performance of the facilitator, who generally guides it through three successive experiments (Ashby 2000).

However, experiences gained during implementation prompted FIPAH to make some critical changes to this methodology. A survey in 1997 indicated that the CIALs were dominated by local elites, as community members saw them as the most suitable and voted them in (Classen et al. 2008; Humphries et al. 2012). To prevent exclusion of the poorest families and women because of selection criteria such as literacy, land ownership or prior project experience, FIPAH encouraged anyone interested to join the CIALs as "ordinary" members — in addition to the four elected — who could then rise through the ranks to positions of leadership. Thus, the CIALs were enlarged beyond the four-member committee designed by CIAT to include up to 20 members. FIPAH's "ethic of inclusiveness" paid off. Survey data in 2004 indicated that most CIAL members came from the poorer households, including many women (Classen et al. 2008; Humphries et al. 2012). Wealthy landowners had deserted the CIALs, leaving them to the marginal community members. FIPAH also made changes in the funding of the experiments. Initially, all experiments were underwritten by a CIAL fund and led to private benefit of individuals. To avoid this, FIPAH took control of funds for experimentation and allocated funds only to collective experiments to produce public goods. These experiments focused mainly on improved seeds through a process of participatory plant breeding, in which the farmer-researchers learned to undertake systematic breeding experiments. Other agricultural practices, such as soil conservation and management, were encouraged through group learning processes, but implementation and financing were left to individual landowners.

FIPAH also moved the CIALs to take on a broader set of activities to support experimentation, such as income generation, savings and loans, collective grain storage, household budgeting and accounting, crop diversification, backyard gardening, biodiversity fairs, and exchange visits between CIALs.

During the early years, all the facilitation for establishing and strengthening the CIALs was done by FIPAH agronomists, which meant that they could not cover a large area. In 2000, FIPAH staff began to train farmer-researchers in facilitation of CIALs and took them on as part-time facilitators, giving them sufficient time to work on their own farms as well. This allowed FIPAH to extend its work to a larger area and to involve more people in CIALs.

The first two CIALs were formed in 1993 and during the early years had only men as members. In the next 20 years, FIPAH's work extended to three regions in the country, namely Yoro (municipalities of Yorito, Sulaco, Victoria), Francisco Morazan (Vallecillo) and Intibuca (Jesus de Otoro). According to data provided by a personal communication from Humphries, the number of CIALs grew in this period to 1,113 members — 486 women and 627 men — in 100 committees, of which 28 are youth CIALs and 72 are adult mixed-gender CIALs.

Impact

Findings from the farmer-led research

CIAL members, both men and women, have carried out hundreds of experiments to find new varieties of maize and beans — their staples — that are well adapted to their ecological conditions. They first tested varieties coming from the formal research system but then realized that these were not likely to improve yields in their diverse microclimates. So they came up with the idea of improving their own landraces, supported by a process of participatory plant breeding. Four CIALs in Yorito, comprising 30 men and 23 women, worked for five years and released their first improved high-yielding variety of bean "Macuzalito" in August 2004. Since then, six more varieties have been released and four are in the process of being released. The same has been done with maize. The CIALs have bred six new varieties. Two — Esperanza and DICTA Maya — have been released nationally and two more are about to be released, while two have been released locally; a study is underway to assess adoption and impacts of these varieties. According to data from 2007, farmers are willing to pay a premium for the locally produced seed, and local demand was exceeding supply.

Through this process farmers have begun to recognize the value of older, lesser-known landraces, and are retaining them. Seed banks are being maintained by the CIALs; each year, committee members take responsibility for growing out the different varieties and lines to guarantee germination rates. This has led to an increase in local agrobiodiversity and a local system to retain and further improve it. According to FIPAH's recent data, provided in a personal communication from Humphries, there are 13 seed banks managed by CIALs.

In addition to varietal selection and plant breeding, all farmers involved in CIALs report applying a range of agricultural practices, tried out through experimentation, to improve land productivity in a sustainable way. These include use of organic manure, erosion-control measures, zero and minimum tillage, and use of green manure to increase soil fertility. In a personal communication, Humphries mentioned data from a FIPAH report to USC Canada in 2010, covering 450 CIAL members, which stated that 45 percent use organic inputs, 51 percent incorporate crop residues to improve soil, 19 percent use green manures and 92 percent have stopped burning as a way of clearing plots.

Women involved in CIALs have gained valuable agricultural skills and are now able to carry out all the activities independently — from sowing to harvesting — instead of simply helping out the men in weeding. Husbands of CIAL members recognize and respect the competence gained by their wives. According to ASOCIAL and Classen (2008), women engaged in agriculture can now look after themselves and their families if their husbands leave or die, which is something they could not have done before the CIAL.

The 2004 survey data show that CIAL members have a higher capacity for problem identification and solution development and are confident in performing experiments on their own farms to seek solutions to agricultural problems. CIAL members are recognized as "most knowledgeable

about agriculture" in their communities, including among nonmembers. Likewise, 64 percent of nonmembers stated that they had learned and adopted improved farming techniques of various sorts from the CIALs, 12 percent learned about new crops, and 3 percent indicated that they had improved their own capacity for experimentation. Also, 86 percent of the nonmembers found the activities and solutions presented by the CIALs so relevant for their needs that they would pay for their services, either through trade or cash.

In a personal communication, Humphries reported that according to initial findings of the assessment currently underway, the newly bred seed varieties are being used widely in the communities. Approximately 60 percent of those not involved in CIALs are using the seeds.

Impact on farmers' livelihoods

According to the 2004 study, the majority of households participating in CIALs have significantly improved their yields of maize and beans, although no quantitative data are available. This has enhanced their food supply and has reduced, or in many cases eradicated, the period of food insecurity — eight weeks at most for CIAL members' households, compared to up to 20 weeks for nonmembers. Project histories recorded during the height of the hunger period in 2006 revealed that communities considered the reduction in the hunger period, achieved primarily through yield increases, as a key benefit of the CIALs. Families learned to calculate how much grain they consumed in a year so that they could ascertain the deficit after harvest and buy what they needed when the prices were lower. This prevented them from having to buy grain at much higher prices when they ran out of food.

Increased income from improved bean and maize production has allowed CIAL members to increase their savings and to invest in livestock, mainly chickens and pigs. Data from 2004 showed that more than 55 percent of CIAL members had savings, compared to 10 percent of nonmembers.

Enhanced local capacity to innovate

CIALs have provided an appropriate learning environment for their members. In addition to technical skills in agricultural research, committee members have gained organizational and leadership skills by working collectively and by holding various positions within the groups. The CIALs have also created a supportive social network for households that were previously isolated from one another. Members refer to the CIAL as a family where there is friendship, love and support. This has led to an increase in confidence among committee members and helped them move away from being *conformistas* — those who accept their lot and feel it cannot be changed — to become more assertive and forward-thinking *futuristas* — those with capacity to aspire for change. This has been particularly significant among women who were previously marginalized from being active outside their domestic sphere.

This increased confidence is also evident in the readiness of CIAL members to join other organizations. Data from 2004 showed that individuals increased their linkages significantly after joining a CIAL. While only half the women members had even a single organizational linkage prior to joining the CIAL, by 2004 they had an average of four. Men increased their linkages from less than one before the CIAL (0.94) to three in 2004.

Classen refers to interviews in 2004 in which some respondents mention participation in the CIALs as having stimulated those with minimal or no formal education to take up adult education classes offered through the radio or from local elementary school teachers, but no quantified data are given (Classen et al. 2008).

CIALs have set up group schemes to provide credit for collective and individual production and experiments. These schemes have helped break dependence on moneylenders and selling at low prices. Loan repayment is reported as high. CIALs have also ventured into various income-generating activities.

CIAL members who have been trained as farmer facilitators have gained the skills to facilitate the process independently within communities.

CIAL members are also active in the regional associations known as *Asociaciones de los Comités de Investigación Agrícola Local* (ASOCIALs) and the national association of CIALs, which indicates their increased networking capacity. These CIAL associations establish and maintain linkages with other actors and organizations at regional, national and international levels.

Impact on formal and informal research and development organizations
In participatory plant breeding, CIAL members have been partnering with scientists at the Panamerican Agricultural School at Zamorano, facilitated by FIPAH. This is the first time that the school has taken on such an approach to breeding, and the regional scientists have been showing a great deal of interest in it. The formal approach to plant breeding that is being followed by the farmer-researchers, supported by FIPAH agronomists, is being recognized by the scientists.

According to a personal communication from Humphries, FIPAH and the CIALs have also partnered with the FAO, the International Maize and Wheat Improvement Center (CIMMYT), and the *Dirección de Ciencia y Tecnología Agropecuaria* or "Honduran Agricultural Research and Extension Directorate," known as DICTA, being recognized by the scientific community for their work in plant breeding and genetic resource conservation. FIPAH is a key member of the national committee for plant genetic resources and is involved in developing a regional strategy to conserve genetic resources. The FAO considers FIPAH a strategic partner and is investing in a seed facility in Yorito to enable the CIALs to produce basic seed as well as potential genetic seed material. This is the first time that such a facility is being set up outside the purview of a formal research institution.

CIAL membership in a national ecological federation has led to collective action to prevent the introduction of genetically modified maize and to support farmers' rights regarding access to and control over local crop varieties.

Summary of lessons learned
Close observation and conscious adjustments — such as adapting the CIAL methodology to be inclusive after the survey in 1997 — by the facilitating NGO, FIPAH, made it possible to open up spaces for marginalized groups such as very poor families and women to join and participate actively in the CIALs.

Expansion of the process beyond research to incorporate development activities that provide shorter-term benefits helped sustain the motivation and involvement of the farmers, especially of very poor farmers, in a participatory plant breeding process with gains in the longer term.

Small but consistent funding received by FIPAH and IPC enabled the NGO to build close and strong ties with the communities and to provide the intensive training, mentoring and facilitation demanded by the CIALs in the early years.

Training members of the CIALs as farmer facilitators to take over tasks from FIPAH staff helped to spread the committees to a wider area and to build capacity within the communities to facilitate committees within and beyond CIALs.

The agronomists working in FIPAH are respected both by the farming community and by the formal researchers. This has facilitated the farmer-scientist partnership. Recognition of the CIALs' plant-breeding work by formal scientists has enabled the committees to have an impact on seed production and genetic resource conservation at the national level.

Building the capacity of CIAL members not only in technical aspects such as plant breeding but also in social and organizational aspects has made them self-confident and assertive, transforming them into active members of the community capable of expressing their views and making collective decisions.

Sources of information and data
The articles used in this review and referred to below are based on data gathered through a series of studies and impact assessments conducted in FIPAH's operational areas. These include a baseline study in 1997 in 11 communities where CIALs had been set up (113 people interviewed, including 55 CIAL members); an impact assessment in 2004 that comprised qualitative, participatory and quantitative data collection and analysis (impact indicators identified through informal interviews and focus-group discussions were incorporated into a survey carried out among 300 randomly selected CIAL members and nonmembers in 10 communities with over five years' experience with the CIAL as well as two counterfactual communities; results of the quantitative analysis was discussed during focus-group discussions in the 10 CIAL communities, as well 10 other communities located in the regions under study); 31 life histories (16 male and 15 female) recorded for a research initiative in 2006; and 19 structured interviews conducted in 2011 with men whose wives had been in a CIAL for seven or more years by that time.

Additional data were provided by Sally Humphries of the University of Guelph, Canada.

Personal communication with persons directly involved
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Case 9: Kuturaya participatory extension approach in Zimbabwe

Introduction
The Intermediate Technology Development Group (ITDG), a UK-based international NGO that was renamed Practical Action in 2008, started working in Chivi District of Zimbabwe in 1991 through the Chivi Food Security Project. The project phased out in 1997. Around the same time, the German-funded Conservation Tillage Research Project (ConTill) started working with farmer groups in the area and worked closely with ITDG in developing the farmer-led approach.

Chivi District is located in Masvingo Province of southern Zimbabwe. In 1990, it had a population of 170,000 and a population density of up to 100 inhabitants per square kilometer. In the early 1990s, the population was growing by about 3 percent per year, putting enormous pressure on the land. Holdings averaged 1.2 hectares per smallholder farming household and were declining. With an

average annual rainfall of 530 millimeters, subsistence agriculture formed the basis of the rural economy. The project worked in two of the approximately 30 wards that formed the Chivi District, initially in Ward 21 and later also in Ward 4. The total budget of the project was EUR 570,000, most of which came from Comic Relief in the UK, the EU, the UK Department for International Development (DFID) and the Humanist Institute for Cooperation (known as Hivos), based in the Netherlands. This included the costs of preparatory consultancies in 1989–1990. In the first few years, the work was done by one ITDG project officer; the number of project staff later increased to four. According to Murwira et al. (2002), the cost per household reached by the project was just below EUR 50.

Theory of change. The project design was based on growing recognition of two factors: a) technology development and use as a social process, implying that work at the socio-institutional level was required as part of the farmer-led research approach; and b) the importance of working directly with local service providers such as government extension and research stations, other NGOs, and training institutions to foster linkages between them and the farming communities, as well as with farmers in other districts, that could be continued after ITDG phased out. The unwritten theory of change was that, by approaching technology development and use as a social process involving groups of smallholder farmers as well as local service providers, linkages between these actors and institutions will be strengthened so that a process of developing appropriate technologies for smallholder farming will be able to continue after the project intervention ceases.

Approach and process

The participatory extension or "Kuturaya"[22] approach involves working through farmer groups. This was based on an analysis that groups play an important role in sharing knowledge and skills, providing mutual assistance such as through exchanging labor on a rotational basis, and sharing assets such as plows. Working through groups also allows rapid generation of ideas to solve common problems and creates advantages of scale through bulk discounts for purchases, transport and marketing (Croxton and Murwira 1997).

At the start of the project, ITDG made an extensive survey of the formal and informal institutions and groups operating in the area. It concluded that the existing farmer groups — often linked to the Zimbabwe Farmers' Union — and the gardener groups dominated by women would be the best starting points for farmer group interaction and strengthening.

PRA activities were central to the initial analysis and planning phase in the process. This was followed by a well-structured community meeting in which results were discussed, main areas of concern for joint work agreed upon and initial activities planned. In Ward 21, this process led to identification of soil and water conservation and pest management as priority issues for research.

The socio-institutional dimensions of farmer-led innovation development were addressed through the Training for Transformation methodology (Hope and Timmel 1996), which was used extensively with the support of a specialized NGO, Silveira House. This training methodology mobilizes farmer participation and works toward higher levels of community ownership and control of the development process. It also assists groups to analyze their functioning and management, roles and responsibilities, and opportunities and constraints, and to plan courses of action together. It pays special attention to leadership development.

The Kuturaya approach was central to the implementation phase. It was regarded as important and necessary to develop improved practices that work under smallholder farmers' specific conditions, as technologies from formal research promoted by extension did not appear to perform well under farmers' conditions. Activities included farmers' own experimentation using simple pairwise comparisons as well as more systematic joint experimentation involving formal researchers (Hagmann et al. 1998). Details on the design of these experiments were not found in the documents consulted. Two farmers from each village were chosen by the community to join the thematically

focused groups that initially conducted the trials. Later, the wider community became involved in the experimentation activities. As part of the process, workshops for farmers and researchers were organized at the end of the growing season to review and evaluate the management and results of the trials. Ideas and practices studied during joint experimentation included options from research and local training centers, as well as from farmers' own innovations. Later in the project, farmers themselves often initiated trials, such as on millet varieties obtained from other parts of the country.

Competitions organized by the farmer and gardener groups were an important activity that continued after the project ended. These events created space for sharing practices and experiences both within and outside the groups and encouraged adaptation of the recommended practices to suit the requirements of the Chivi farmers (Croxton and Murwira 1997).

Institutional arrangements and context

The Chivi project was led and coordinated by an international NGO that collaborated closely with other agricultural research and development actors. The government Department of Agricultural Technical and Extension Services (Agritex) was a key partner in this collaboration. The project deliberately interacted with Agritex at field, district and provincial levels through direct involvement of field staff, sharing of reports and documents, and organizing field exposure visits. Thus, the provincial officers knew enough about the project to keep the national-level Agritex officials informed. Close involvement of field-based extension workers in using the approach was intended to show senior officials in Agritex that field staff could adopt a participatory approach in their work.

The Chivi project also collaborated closely with German-funded ConTill, operating within the purview of Agritex. This project had started in 1988 with on-station research through adaptive on-farm trials and later changed its approach to FPR (Hagmann et al. 1997). In 1993, ITDG and ConTill staff consolidated their experiences into one approach and jointly documented this as the participatory extension or Kuturaya approach that is described below.

From 1995 onwards, the joint experiences of ITDG and ConTill in using the Kuturaya approach formed the basis of a combined effort to mainstream the approach by developing the competences required for it within the Ministry of Agriculture. This was part of an organizational development program that was supported by the German-funded Integrated Rural Development Programme within the provincial Agritex office in Masvingo. All staff — more than 300 people — in the province went through an iterative training program in participatory extension, while the organizational development work helped the provincial department revisit its internal structures, roles and responsibilities. As part of this mainstreaming effort, Agritex further consolidated the approach and documented it in a field guide, a training guide (Hagmann et al. 1998) and a video.

ITDG's work in farmer-led research focused exclusively on Chivi as described above. It is through its collaboration with other organizations such as ConTill and Agritex that the Kuturaya approach became connected to wider research and extension processes.

The political context in Zimbabwe initially favored the efforts to integrate the Kuturaya approach into the government extension system. The organizational development program of the mid-1990s fitted smoothly into the Public Service Reform process initiated by the government to improve its performance. However, the political changes that took place in 2001 brought an end to the organizational development program and its competence-development activities, as promotion of the Kuturaya approach became synonymous with subversion, according to a personal communication from Hagmann. Yet, despite the continuing political instability, Practical Action, as ITDG is now known, appears to have continued to seek ways to work with the Ministry of Agriculture, as the NGO produced an updated guide to the participatory extension approach jointly with the Ministry of Agriculture in 2010.

Impact

Findings from the farmer-led research

The documents consulted do not include detailed presentation or analysis of data and findings generated by farmers' own experiments or joint experimentation.[23] Murwira et al. (2002) suggest that sharing and discussing of yield data after experiments is not an accepted practice in the local context.

More generally, the 1998 Ministry of Agriculture guide and several publications by Hagmann et al. confirm that more than 20 innovative land-husbandry technologies were developed with farmers through the Kuturaya approach in Chivi in less than four years. Because these technologies were developed by farmers with diverse levels of skills and resources, they were well aligned with the heterogeneity of the rural people.

Citing results of review discussions with farmers noted in internal project documents, Murwira et al. (2002) present what farmers perceive as main advantages and disadvantages of some of the soil and water conservation practices, such as tied ridging and infiltration pits, and gardening improvement practices — focusing on the amount of water saved as compared to labor investments. The authors also note the diversification of crop species and varieties grown in the gardens as an indicator of success of using the improved practices.

Murwira et al. (2002) review and summarize information on the spread of various practices within the project area. At the end of the project, an estimated 80 percent of the 1,300 households of Ward 21 were found to be applying at least one of the soil and water conservation practices improved through experimentation. There is no information on autonomous spread outside the project area.

Reviewing the spread of nine specific soil and water conservation practices in the main cropping fields, Murwira et al. (2002) note that five of them had spread to an estimated 35–60 percent of the 1,300 households in Ward 21. One of these was a farmer innovation, one originated from research, and the other three were revived traditional practices. The four practices with low spread included two farmer innovations and two from research. A similar analysis of the spread of seven soil and water conservation practices in vegetable gardens, including two farmer innovations, notes uptake of 30–60 percent for all seven.

Murwira et al. (2002) also mention experimentation involving 140 farmers on the use of animal traction, including farmer adaptation of an introduced moldboard plow for ridging, and with crop species and crop varieties, but do not provide data on the findings from their experimentation or their spread. A shortage of appropriate animals seems to have been a major constraint for promoting animal traction in cropping.

The findings and lessons on the use of the Kuturaya approach as an alternative approach to extension have been documented and spread extensively. As mentioned earlier, the combined experiences of the ITDG project and ConTill were documented in a guide to the approach, training materials and a video. The impacts of disseminating this approach are discussed in the section below on impact on agricultural research and development organizations.

Impact on farmers' livelihoods

No systematic information is available on the impact of the Kuturaya approach on farmers' livelihoods in terms of food security or income generation. "Impact indications" reported by Murwira et al. (2002) from a monitoring workshop with farmer leaders in 1995 included increased income generated through sales of surplus vegetables and groundnut, which was invested in fencing and to set up a rotating fund, as well as from reduced costs of production by using new soil-fertility and pest-management practices. Other references to livelihood improvements included an increased presence of buyers' trucks in the area. Marketing and the labor demand on women in the crop-harvesting period, which constrained them from working in their vegetable gardens, were reported as emerging problems.

Murwira et al. (2002) offer a detailed analysis of the gender dynamics in the communities and how the project dealt with them. The project employed a subtle strategy of dealing with gender issues without suggesting an explicit gender objective to the communities. Through efforts to involve women in PRA activities and the Training for Transformation courses, which included discussion of participation of marginalized groups, space was created for women to strengthen their capacities. The choice to work with women's gardening groups was part of this strategy. From 1994 onwards, some specifically gender-related activities were undertaken, including participation of community members in an externally organized course on gender, project studies on gender issues and a gender workshop in Ward 21. The impacts of these interventions are reported in qualitative terms and included economic empowerment of women through increased sales of vegetables, leading to changes in power relations within the family, personal growth and leadership development. An indication of the higher status of women and women's activities is noted in the example of men's starting to grow groundnut, previously considered a "woman's" crop.

Enhanced local capacity to innovate

In terms of local organizational development, in the period from 1993 to mid-1996, the number of active farmer groups and clubs in Ward 21 rose from nine to 33, average membership per group or club rose from 16 to 30, and total membership rose from 161 to 865. In the same period, the dominance of affluent farmers decreased and the membership and leadership became more representative of middle- and lower-income households (Croxton and Murwira 1997). In 2009, the number of clubs had more than doubled again to 70 (Ministry of Agriculture 2010). Women's garden groups had also increased from 28 in 1993 to 72 in 2009.

Within the groups, the Training for Transformation approach led to greater democratization of leadership and more transparent decision-making. In turn, this increased group effectiveness, attracted new members and thus increased representativeness. The emphasis on facilitation and on gender and development led to women's being able to facilitate their own project reviews (Croxton and Murwira 1997). During a workshop in 1994, farmer group leaders cited as key impact areas the capacity and confidence to organize their own meetings, fairs and fields days; to arrange elections; to host visitors; to link with other organizations; to follow up promises by others such as the Zimbabwe Farmers' Union; and to mobilize farmers to join the groups (Murwira et al. 2002).

The farmer groups established a ward committee to spearhead development activities in the area. According to Masendeke (2003), this committee was well-structured and influential in development initiatives in the ward. In addition, the groups set up the Chivi South Development Trust to continue the work, source funding, seek services and build partnerships with outsiders once the ITDG support phased out. The trust had its offices in the district council's premises, indicating that project activities were being incorporated into the development agenda of the district. However, Masendeke concludes that the basis for establishing the trust was too weak, both in terms of farmers' capacities to manage such a formal structure and the lack of a funding base other than the initial support given by ITDG.

Masendeke (2003) observes that the less formal ward committee continued to function. The 2010 version of the Ministry of Agriculture guide on the participatory extension approach still refers to Ward 21 in Chivi very positively: "The Ward 21 Community has continued to be a torch bearer in terms of self-organizational capacity, self-reliance, being proactive in terms of initiating activities and linking with a wide range of partners and other communities. Farmers are organizing field days, organize farmer panels to judge farmers and get Agritex staff involved as well. Every year they undertake monitoring, evaluation and planning activities, including identifying areas where they need external support. Leadership rotates regularly. It is one community where both young and old, men and women, literate and illiterate members can share leadership positions."

Creating linkages between farmers and other institutions was central to how ITDG applied the farmer-led approach in Chivi. Linkages were established or improved between farmers and a host of other organizations, such as the Department of Agricultural Research and Rural Extension, of which Agritex had become part, as well as the Zimbabwe Farmers' Union, Silveira House, other NGOs, innovative farmers in other districts, Zvishavane Water Project, Chiredzi Research Station, Makoholi Experiment Station, Matopos Research Station, Mutoko Communal Area and Fambidzanayi Training Center (Masendeke 2003). A wider range of technological choices was made available to the farmers through these linkages. The continuation of the farmer field days with external actors in Ward 21 after the end of the project suggests that the local groups have maintained such linkages.

In February 2014, Kuda Murwira, a former staff member of the ITDG project, visited Chivi's Ward 21 and went to six sites where the project had been operating. In the report, it is stated that the impacts of the project can still be seen 20 years after it ended. The report on the field trip concludes with this statement: "Ward 21 in Chivi district portrays a high level of community empowerment and implementation of [the participatory extension approach]. Three of the six sites that were visited are at advanced levels of community empowerment; they are able to implement their projects with little to no external assistance. AISP III[24] can benefit from utilising the experiences of Chivi district in three of the four thematic areas, i.e. extension and training, good agricultural practices and group development" (Murwira et al. 2014).

Impact on formal and informal research and development organizations
The Kuturaya approach empowered farmers to demand changes in the approach and attitudes of extension workers. This, in turn, resulted in Agritex workers demanding training, and these effects have rippled upward through the organization (Croxton and Murwira 1997).

The direct links between the ITDG project and ConTill led to the formulation and later upscaling of the approach in Zimbabwe. This also had a considerable impact on agricultural extension in Limpopo Province of South Africa through the German-funded project Broadening Agricultural Services and Extension Delivery (BASED). The involvement of key Zimbabwean staff as consultants to this project and visits of senior Limpopo government staff to Chivi District for direct interaction with both farmers and local government officials created the inspiration for a major effort to integrate the participatory extension approach into the work of agricultural research and development actors in Limpopo. In the absence of external impact assessments, it is impossible in the context of this desk study to assess the impact of this work. The indications are that, while key agricultural research and development institutions such as the Department of Agriculture became strongly interested in the approach and while capacity building was done successfully (Ficarelli et al. 2007), full integration of the approach did not take place because of internal institutional dynamics as well as the wider policy changes around extension (van der Lee 2010).

According to a personal communication from Hagmann, participatory extension has also been introduced as an approach in the Dominican Republic, Cambodia, Tanzania, Mozambique and other countries, making use of the resource team from Zimbabwe that grew out of the Kuturaya experience.

Summary of lessons learned
Giving government field staff a key role in farmer-led research supported by CSOs helps to build confident and well-capacitated staff members that are able to put pressure on the formal extension system and demand approaches that favor farmers' participation. This was a powerful strategy in institutionalizing farmer-led research within Agritex in Zimbabwe.

Documentation on the work in Chivi by the NGO does not include quantitative or qualitative findings of experimentation — of farmers' own or of joint experiments. Experimentation is used as a basis for farmer-to-farmer sharing and learning, mainly through exchange visits. Research could play an important support role in systematizing the lessons and findings of CSO-facilitated farmer-led research, including quantitative data processing. ConTill played this role to a certain extent (see footnote 23) but most ConTill-related documentation available focuses on the process of applying and upscaling the participatory extension approach.

The power of the Kuturaya approach is partly in its integration of social-organizational development with agricultural-innovation work. This integrated approach seems to lead to increased capacity to innovate, as evident from the continued development work of farmers in Ward 21.

All the above information is extracted from documents written directly or indirectly by people involved in the work, with the exception of the Master of Science thesis by van der Lee (2010) on the experiences with participatory extension in Limpopo Province in South Africa. External assessments could not be found within the given timeframe for this desk study, despite communication with several people involved in leading positions. Information on the spread of the successful practices that came out of the Kuturaya process beyond the project villages, either through an autonomous process or through extension and other agencies, is also lacking. A lesson that emerges from these observations is that much more attention needs to be given to independent assessment of new approaches to agricultural research and development and monitoring of the impact after the end of the intervention.

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Case 10: Participatory technology development as an approach to extension in Vietnam

Introduction

The Social Forestry Support Programme, which ran from 1994 to 2002, introduced social forestry into education and training in seven institutes in Vietnam, a country with over 80 million inhabitants. It was funded by the Swiss Agency for International Development and Cooperation (SDC), which mandated Helvetas as the implementing agency to work with government agencies of research, extension and education. The project partnered at the national level with the Ministry of Forestry, which later merged with Agriculture and Fishery into the Ministry of Agriculture and Rural Development, and with the Ministry of Education and Training, working together with provincial and district authorities in three provinces, covering six districts and 21 communes. In 1999, with advisory support from the *Landwirtschaftliche Beratungsstelle Lindau* (LBL) or "Agricultural Advisory Service Lindau," which is now known as Agridea,[25] Helvetas introduced participatory technology development (PTD) to university lecturers initially in Hoa Binh Province and then in Dak Nong and Thua Thien Hue provinces. The purposes were the following: i) to give the lecturers field experience and direct exposure to smallholder farmers' realities; ii) to forge closer collaboration between provincial institutes of research, extension and education in working with farmers; and iii) to generate relevant knowledge and locally adapted technologies of forest resource management. The project planners thought this approach would be especially appropriate for the difficult and diverse ecological and socio-economic conditions where ethnic minorities lived in remote areas with limited access to external resources but with rich indigenous experience and culture. The PTD approach was explicitly introduced to benefit poor farmers.

Building on the experiences of the Social Forestry Support Programme, the subsequent Swiss-funded Extension and Training Support Project for Forestry and Agriculture in the Uplands, which ran from 2003 to 2007, aimed to mainstream PTD and other participatory approaches within the universities and extension organizations working in forestry and agriculture in the same three provinces. The Extension and Training Support Project focused on improving development planning of government institutions at commune, district and provincial levels, and used the PTD approach primarily to improve the links between research, extension and education.

In 2004, the Extension and Training Support Project introduced the FFS approach. Theoretically, this could be combined with a PTD approach, but the project's description of the FFS approach suggests that it was applied primarily in a transfer-of-technology mode. In 2005, the Extension and Training Support Project introduced the Commune Extension Network to link extension with other services such as credit and market access at commune and district levels. Village extension workers were paid according to an output-based system out of commune funds or by individual farmers who received the services. In all communes where the project operated, facilitation of PTD did not appear as one of the services rendered. The Extension and Training Support Project was followed by the Public Service Improvement Programme for Agriculture and Rural Development. This operated during 2008–2010 and 2011–2015[20] and pursued this line further to strengthen decentralized public service delivery in rural development, focusing on two provinces: Cao Bang and Hoa Binh. PTD is no longer mentioned in the Public Service Improvement Programme documents.

Thus, specific support to PTD was provided from 1999 to 2007, at which point the Extension and Training Support Project ended. The most intensive work appears to have been done in Hoa Binh Province. After a workshop in 2004 to assess the approach, the Provincial People's Committee allowed it to be tested in the entire province. The Extension and Training Support Project trained PTD trainers, and then the Provincial Extension Centre trained provincial and district staff. The trained people initiated PTD in nine districts and held reflection and sharing workshops. Total funding for the Social Forestry Support Programme in 1994–2002 was CHF 14,340,000, and total funding for the Extension and Training Support Project in 2003–2007 was CHF 8,876,000, but only a small part of the whole went to PTD activities. According to the monitoring data from the Extension and Training Support Project, in total 2,114 farmers were involved in PTD experiments and FFS training during that phase (Schaltenbrand and Tuan 2008).

Wider context. Agriculture is the main source of income for upland farmers in Vietnam, who had limited access to agricultural research, extension and training services because of insufficient institutional capacity to deliver these in remote areas. After a long tradition of centralized planning, in the 1990s the Government of Vietnam developed a policy of public administration reform. This included transferring responsibility for agricultural research, extension and education from the central to provincial and lower government levels. In natural resource management, responsibility for forest management was transferred to the communes. This greatly changed the forestry profession. The Social Forestry Support Programme was therefore designed to transform education in universities to promote social forestry. The government policy favored decentralized and participatory approaches, reinforced by the Grassroots Democracy Ordinance of 2006 and other decrees that enabled citizens to take part in local-level policymaking. Thus, the policy environment for upscaling PTD was quite favorable, at least on paper.

Theory of change. If PTD centered around farmer-led experimentation can be integrated into agricultural and forestry universities and extension centers, then university researchers, lecturers, students and extension staff will be able to collaborate with farmers to develop appropriate innovations in managing and using natural resources. This focus on building capacity in PTD and other participatory approaches will make it possible to spread a decentralized, cost-effective and demand-driven system of natural resource management research, extension and training into remote upland areas in ways that will lead to improved livelihoods of the local people.

Approach and process

As described in the project documents and evaluation report (Boi et al. 2007), the PTD process involved outside professionals working together with farmers to learn from each other so as to develop or adapt technologies suited to local conditions. The major steps were as follows: problem analysis using PRA tools; jointly seeking ideas to test or "pilot"; planning pilot activities; farmer-managed experiments to test the new ideas; evaluating and documenting the results; and sharing them more widely. University lecturers and extension staff facilitated farmer-led experimentation with new ideas that reportedly often came from farmers. Experiments were conducted, such as on winter fodder, seed potato production, improving soil fertility, pesticide reduction, orchid growing and eel raising. The project staff developed simple forms in Vietnamese for planning the trials and recording the results. The farmers and facilitators jointly defined criteria for assessing the results and indicators to be observed during the trials. The individual farmers were supposed to cover all costs of experimentation themselves. Even though they were not using public funds to experiment on behalf of others, they willingly shared their results, primarily through on-site workshops. The project also developed extension materials such as brochures that were easy for illiterate farmers to understand. The university and extension staff drew lessons from the process and outcomes on the ground, fed these lessons into curriculum adaptation through review workshops, and compiled them to produce a PTD manual in Vietnamese and English (Huy et al. 2002).

Specific attention was given to institutionalizing the approach. For example, workshops were held with high-level people from various provincial governmental organizations, using techniques such as mindmapping and force-field analyses in a participatory way to discuss how to apply the approach in the agriculture and forestry extension system and how challenges to institutionalization could be overcome.

Links with other activities. In a diagram of actors and approaches in the Research, Education, Training, Extension Network set up by the Extension and Training Support Project to coordinate project activities, PTD is shown as the linking activity between applied research and agricultural advisory services (Schaltenbrand and Luong 2007). The project took a systematic approach from local-level planning to action, developing and spreading appropriate innovations through participatory experimentation and informal education (FFSs). However, according to an email from Helvetas Vietnam in March 2014, PTD training was not combined at commune level with the training in participatory planning or at provincial level with the training in learner-centered teaching methods.

Impact

An external impact analysis of the Social Forestry Support Programme was made in 2007, five years after the project ended. Methods included group discussions; semistructured interviews; storytelling to gather opinions of different project participants; questionnaires for core members of the project, university heads and forestry graduates; and the "behavior ladder," inspired by the outcome-mapping method.[27] The impact analysis focused on institutional changes brought about by the project. In addition, the project organized several workshops for internal reflection on the PTD methodology and scaling-up process.

Findings from the farmer-led research

The external and internal review documents make little reference to specific topics of or findings from farmer-led experiments. According to a 2003 SDC factsheet, by that time, initial results and innovations of the PTD activities were visible in land allocation, land-use management, erosion control, income generation, agroforestry, forest management and improvement, and use of nontimber forest products.

Impact on farmers' livelihoods

The statements found about impact at farmer level are very general. By introducing a multistakeholder approach to agricultural research and development that led to locally useful innovations, the Social Forestry Support Programme and the Extension and Training Support Project contributed to improving living conditions in the rural areas where they worked. Through PTD, farmers and extensionists gained practical experience with new technologies, and, because they were recording their own data from the experiments, they could easily disseminate the results to other farmers and communities (Boi et al. 2007). In Hoa Binh Province, PTD activities led to higher incomes for farmers (Schaltenbrand and Luong 2007). The impact analysis noted the PTD piloting activities in using natural forest allowed "durable" arrangements for groups of households in Dak R'Tih Commune, Dak Nong Province, to access these natural resources.

An early report on results and impacts of the approach stated that the farmers' experiments attracted many farmers from surrounding communes, who then started up similar experiments on their own, such as diversifying their coffee plantations with fruit trees (Cai et al. 2003).

According to the impact analysis report, PTD led to successful innovations for the farmers involved, but it was difficult to replicate the results. For example, farmer-experimenters achieved good results with giant tea for fodder, rattan protection fences and growing Liong bamboo in gardens, but other farmers without secure access to land could not apply these technologies (Boi et al. 2007). The innovations were often specific to certain ecological areas and could not be widely scaled up. Moreover, some ethnic minority groups were said to be passive, receiving government subsidies, and had little interest in applying the new technologies.

The impact analysis team thought the project gave insufficient attention to monitoring and documenting outcomes of PTD activities in terms of natural resource management and sustainable livelihoods of the local people. There was therefore not enough "persuasive motivation" for applying the approach in forestry in Vietnam (Boi et al. 2007).

An internal review of the Extension and Training Support Project (Schaltenbrand and Luong 2007) listed the following key achievements at farmer level: increase in yields of all major crops, including rice, maize and cassava; higher income from crop sales, also partly due to better prices; and diversification of income sources toward annual and perennial cash crops. However, it did not make clear to what extent these could be attributed to the PTD approach. No differentiation was made between benefits accruing to richer versus poorer farmers. Neither the impact analysis nor the internal reviews mention any outcomes and impacts with respect to women or youth.

Enhanced local capacity to innovate

The review documents focus on capacity change in government institutions and give little attention to capacity change among farmers. The impact analysis team did note, however, that some of the farmers involved in project-supported PTD continued experimenting with other things after the project ended (Boi et al. 2007). They did not mention whether the more systematic approach to experimentation promoted by the project was also being practiced by other farmers in the meantime.

Farmers reportedly became more confident in explaining their experiments to other farmers and visitors, and this confidence led to their becoming more involved in other self-help activities for community development. There was better mutual understanding between farmers and local extensionists: more sharing of problems in discussions and a more positive attitude of extensionists toward farmers' abilities, which reinforced the farmers' confidence. A network was developed by key farmers, who formed local interest groups to do joint experimentation (Cai et al. 2003).

Farmers from Dak R'Lap speaking to government officials at a project workshop reported that their experiments were based on the demands of the farmers in the community and the resources available to them. They said that they had expanded their experimentation on their own. At this workshop, the strengths of PTD were listed as farmers being more confident and more open to learning, with improved skills to try things out on a small scale, which reduces risks and costs in case of failure (Helvetas Vietnam 2005).

Reports from the field[28] state that the farmers in Cao Bang Province were extremely enthusiastic about the experimentation and set up many interesting trials but often wanted to find out too many things in one trial at the same time; they had to learn a lot about experimentation, monitoring and documentation. Such a learning process seems to have taken place at least in Hao Binh Province: At a reflection workshop in 2006, the extensionists said that farmers were conducting and reporting their experiments well, including the costs and benefits of the innovations (Huy and Ly 2006). By being involved in evaluating the results of their experiments, the farmers gained a better understanding of the technology and the conditions that make it work. This made them effective in sharing results from farmer to farmer.

The internal review suggested that, despite the efforts aimed at gender mainstreaming, gender-specific results remained abstract and vague. It stated that more careful and participatory gender analysis should have been done in each particular ecological region and ethnic group, so that practical steps toward change could have been made (Schaltenbrand and Luong 2007).

Impact on formal and informal research and development organizations

The focus of Helvetas' work in Vietnam was on institutionalizing PTD and other participatory approaches into government systems. The assessments therefore give most attention to this.

At a reflection workshop in Hoa Binh Province to analyze and assess the PTD methodology and scaling-up process, the extensionists concluded that PTD was an extension method suitable for responding to the diverse needs of farmers. They felt that using this approach had strengthened their capacity to work with farmers, and that it could and should be integrated into other extension activities. They observed that farmers were capably spreading the results of their experiments, with some support from extension. They stressed that PTD supports farmers in solving their own problems and facilitates farmers' "non-stopping innovation"; they thus appeared to have understood the essence of the approach. The extensionists were enthusiastic about the approach but had difficulty finding researchers who wanted to work with farmers to give the required scientific support for the experiments (Huy and Ly 2006).

According to the impact analysis, the Social Forestry Support Programme was the first project to introduce PTD into tertiary education in Vietnam as a field-based participatory-action-research methodology (Boi et al. 2007). It became a subject with 30 credits under the social forestry major at the Vietnam Forestry University and became a chapter in the theme Agriculture and Forestry Extension at four other universities. It was included in postgraduate courses at two universities, and several theses were written on the approach. The practice of PTD helped change attitudes of people in educational institutions and extension organizations. Top-down technology transfer was converted into learning together with farmers.

According to an article on the curriculum development process, the universities were using PTD as a field-based learning and linking activity (Taylor 2005). The impact analysis team indeed found that the collaboration among universities, research institutes and provincial extension centers in PTD — and in developing teaching materials based on this experience — contributed to developing links between research, education, training and extension in the forest sector in Vietnam (Boi et al. 2007).

Hoa Binh Province, with a population of more than 800,000 people,[29] approved PTD as an official extension method and allocated its own budget for training all 214 commune extensionists (Schaltenbrand and Tuan 2006). All district extension stations in the province included PTD activities in their annual workplans, with corresponding budgets. However, although the extension strategy included the term "participatory technology development" alongside many other possible approaches, the general tenor of the strategy was still transfer of technology (Hoa Binh Provincial People's Committee 2007).

Schaltenbrand and Luong (2007) report that the attitude of extension workers to farmers changed. Extension workers recognized that farmers have significant local knowledge and experience from which they can learn. There were changes in ways of working in government institutions related to agriculture, including two-way communication, participatory planning and more decision-making by local people. The PTD training provided a learning platform where district- and commune-level extensionists could apply participatory methods and tools, thus increasing their capacity to support farmers. There were competent trainers in the approach at provincial and district level. The National Agricultural Extension Centre under the Ministry of Agriculture and Rural Development incorporated PTD into the "Curriculum Standard on Training in Extension" to serve as a framework for all provincial extension centers in the country and for the Vietnam Forestry University. The Swiss *Inforesources News* reported that the approaches of PTD, learner-centered training and participatory curriculum development had contributed to formation of a human capital nucleus with relevant knowledge and skills and appropriate attitudes, and that these individuals had become catalysts for social development in Vietnam (Inforesources 2008).

However, other reports from Vietnam told a somewhat different story. Participants in the 2005 reflection workshop on PTD institutionalization in Dak Nong Province stated that the approach was not being widely applied by governmental organizations because the extension policies were not flexible enough to allow innovative approaches to be taken (Helvetas Vietnam 2005). In 2007, the impact analysis team found that PTD and other participatory methods had not been institutionalized in the extension system in Vietnam. All the district extension stations, except in Hoa Binh Province, had stopped applying PTD because there was no budget available for it and because the approach had not been officially integrated as an extension method. The stations gave

demonstrations and training in a technology-transfer mode and gave no attention to ideas coming from farmers (Boi et al. 2007). Xuan Mai, the National Agricultural Extension Centre vice-director and former head of a Social Forestry Support Programme core group at the Vietnam Forestry University, stated: "It is feasible to carry out participatory methods at a smaller scale with full supports from donor programs and projects, but it becomes extremely difficult to up scale them on a larger institutionalized basis due to its dependence from the state budgets" (Boi et al. 2007).

Also at the universities, lecturers in the forestry faculties found it difficult to apply the PTD approach after the end of the Social Forestry Support Programme. They did not continue with the approach because it was too costly and only limited funds were allocated for university research. Commitment to PTD varied among universities and extension centers. Those who continued did so because they could cooperate with other projects through training consultancies or they received support through the Extension and Training Support Project, such as Hoa Binh Extension Centre. By 2007, only the theory of PTD was being taught at the universities because it was too far to travel to the field (Boi et al. 2007). Interviewees from universities and extension who had been working with the project raised the following questions:

- How to involve farmers in PTD without providing external subsidies or with minimal subsidies? Note that this question suggests that, although the approach was supposed to be applied without subsidies, these were indeed provided to encourage farmers to experiment.
- How to adjust the PTD process when the tripartite association of farmer-researcher-extensionist does not happen? Mainly extensionists were involved in the process, while researchers played a limited role because of a lack of budget and of appropriate arrangements outside the donor-funded project.
- How to integrate PTD into the local commune development planning processes?

Also at commune level, PTD did not appear to be a top priority. An impact assessment of commune development funds as part of the 2008–2010 phase of the Public Service Improvement Programme in Cao Bang and Hoa Binh provinces found that, although the communes had experienced PTD, they did not include such activities in the commune development plan for local funding. The sole exception was an FFS group that used commune development funds to learn about pig-raising skills (Truong Xuan Company 2010).

At the same time, the work by Helvetas and *Landwirtschaftliche Beratungsstelle Lindau* on participatory experimentation and innovation influenced other bilateral projects in other provinces in Vietnam. The approach was included in the Belgium-funded Mekong Delta Agricultural Extension Project in 2001–2007 and the subsequent Participatory Agricultural Extension Programme in 2008–2012 working in the five provinces of Ba Ria Vung Tau, Binh Phuoc, An Giang, Hau Giang and Soc Trang. This was implemented by the Flemish Association for Development Cooperation and Technical Assistance, working with Belgium government funds — a total of EUR 1,025,116 over four years. Over time, the PTD approach was applied by projects supported by the SDC and other donors in areas of Vietnam ranging from the northern mountainous provinces to the center, the western highlands and the entire region of the Mekong Delta.

Some results achieved in this more recent work seem promising, but independent impact analyses have not been made. In the Participatory Agricultural Extension Programme, for example, farmers, extension workers and government officials on district and province levels highly appreciated the PTD approach. The extension workers trained through the program had learned much more than just this approach; their communication, guidance, listening and problem-solving skills were also improved in the process. The Flemish Association for Development Cooperation and Technical Assistance reported that the results of the Participatory Agricultural Extension Programme included the following:

- A network of 78 farmer extension clubs.
- Integration of farmers' needs into annual agricultural extension plans.
- Establishment of core groups of 25 trainers in the five provinces.
- Strengthened capacity and field experience in PTD as an extension methodology in partner organizations.
- Ten training packages for farmers, extension workers and core groups of trainers.
- Consolidation of cooperation among the clubs, extensionists and mass organizations.
- Multiplication of participatory extension methods to over 4,000 extensionists and farmers (VVOB 2012).

At the program's final workshop to assess the sustainability of PTD, the partners concluded that it was a very appropriate extension method but faced challenges such as the passive attitude of farmers, limited capacity of extension workers and limited budget of the agricultural extension centers. As a way to tackle the budget issue, they suggested incorporating PTD into the agricultural extension center budgets, using agricultural development funds of the Department of Science and Technology, and using funds from mass organizations (VVOB 2012).

In view of the size and geography of Vietnam and its political history, it has been an achievement that participatory extension based on farmer experimentation was at least temporarily included in the tertiary education system and in policy documents at the national level and also that a gradual shift in mindset was made in formal research and extension services. However, basic institutional structures were not changed and adequate budgets were not allocated so that PTD could be widely applied. Despite persistent efforts over many years to integrate the approach into government institutions of research, extension and education in Vietnam, it was discontinued when external project support ceased. In Hoa Binh, the only province that officially included PTD as an extension approach, it is no longer applied in the extension system. According to a March 2014 email from Helvetas Swiss Intercooperation, with the limited government budget allocated for agriculture services, the extension system now focuses on using demonstration sites mainly to introduce new crop varieties or livestock breeds promoted by private companies.

Summary of lessons learned

Lessons drawn by the documents

The review workshop in Hoa Binh (Huy and Ly 2006) highlighted several lessons, including the following:

- In the district plans to implement PTD, there should be a reserve budget to be able to compensate farmers whose experiments fail because of unmanageable risks.
- To attract researchers to take part in more complex participatory experimentation, there should be a payment mechanism for technical consultancy.
- The specific technologies developed through this approach may be able to improve production and generate income in the households applying the approach but are not always suitable to spread more widely.

The internal review at the end of the Extension and Training Support Project (Schaltenbrand and Luong 2007) drew the following lessons, among others:[30]

- The close collaboration of the Swiss project with departments under the Ministry of Agriculture and Rural Development made it easier to engage in policy dialogue at the national level based on actual field experiences, but the anchorage of the project at national level should have been stronger to advocate for needs-based and people-centered approaches.
- Much more time is needed to institutionalize participatory approaches within government structures; donors do not invest funds long enough for such approaches to be approved by central government.
- Regular, face-to-face capitalization of approaches and experience, not just writing reports, is essential to scale up approaches like PTD.

- To stimulate farmers to engage in PTD, the experiments should help meet farmers' short-term goals of generating income for their households — such as through crops — rather than focus on natural resource management.

Helvetas Vietnam concluded that the original theory of change should be reconsidered. According to a March 2014 email from Helvetas Swiss Intercooperation, it now sees PTD as a potential approach for better-off farmers with better access to information, new technology and resources to take risks, and does not regard it as suitable for poor farmers living in remote areas with limited access to information, less initiative and few resources to be able to take risks.

Lessons drawn by the study team

In a country with a long tradition of centralized power and economy, there are tensions between the stated intention and the actual practice of decentralization and thus strong barriers to changing the relative power of central versus provincial government in deciding on research and extension policies. In addition to working at the provincial level, it is necessary to work also at the national level to institutionalize the approach.

When trying to institutionalize a participatory approach, one needs to be aware that the inclusion of a term such as "participatory technology development" in government strategy and policy papers at the national or provincial level does not mean that the concept is widely understood or can be widely applied. Even if the term is accepted, the underlying principles are often not. Other components of the research and extension systems may remain oriented to technology transfer and, unless deliberate efforts are made to train staff countrywide in the new approach, it will not be applied with a good understanding or in the spirit originally intended.

When projects introduce new approaches, there is a danger that each model is regarded as something separate from the other models rather than being mutually reinforcing, such as PTD as part of the village planning and budgeting process. It is important to integrate farmer-led experimentation with other participatory approaches.

To be able to make conclusive statements on the impact of approaches such as PTD — and thus to have solid arguments to advocate for wider application — more attention needs to be paid to documentation of outputs, effects and outcomes. More emphasis needs to be given to the impact of scaling up the process of PID rather than to scaling out specific innovations that are produced at different sites during this process.

The project focus on institutionalizing PTD within government services meant that little attention was given to impacts at the local level — on individuals, households, informal farmer groups, etc. The farmers monitored and recorded the experiments they conducted, but a different kind of monitoring, evaluation and impact analysis would be needed to discern impacts of the PTD approach on strengthening local capacities to innovate.

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Case 11: Institutionalizing farmer participatory research in southern Ethiopia

Introduction

FARM–Africa[31] is an international NGO working in five countries in Africa — Ethiopia, Kenya, South Africa, Tanzania and Uganda — with the aim of reducing poverty among African farmers and herders. FPR — the active participation of farmers and other stakeholders in agricultural research — has been a central approach used in its work (see also Case 5). In Ethiopia, interest in farmer participation in agricultural research arose in the 1980s when the limitations of previous research approaches — primarily commodity oriented — were being recognized by the formal agricultural research organizations. In the 1990s, external donors supported several participatory research projects in Ethiopia, which included the Farmers' Research Project carried out by FARM–Africa.

This project promoted FPR as an approach to generating and disseminating agricultural technologies that could increase the incomes of resource-poor families in a sustainable way. It was funded by the UK DFID and implemented in the period 1991–1998. The work was small in scale and was carried out in North Omo Zone and two "special districts" in the Southern Region of Ethiopia. The project started by enhancing the capacity of other NGOs to carry out the approach, but eventually worked directly with government research and extension staff. It demonstrated that FPR had positive impacts in improving the livelihoods of poor farmers, and the approach gained favor among the individuals involved. However, the research and extension organizations in which these individuals worked had little understanding of the approach and did not support it. FARM–Africa realized that its efforts would have little impact if FPR could not be integrated into regular government research, extension and education activities.

In 1998, FARM–Africa engaged stakeholders from the major institutions of research, extension and education in the Southern Region in a discussion of the project and its outcomes. The stakeholders saw how the approach had helped research and extension respond to farmers' needs and recommended that FPR be integrated into agricultural research and extension by governmental organizations throughout the region. This gave rise to the project Institutionalisation of Farmer Participatory Research in the Southern Nations, Nationalities and Peoples Regional State.[32] The project was funded by the EU with a total budget of EUR 1,514,511 and implemented from April 1999 to August 2003 in 14 districts across the region, which covers 10 percent of the country. The main partners at the start of the project were the Bureau of Agriculture, Awassa and Areka Agricultural Centres, Awassa College of Agriculture, the Bureau of Planning and Economic Development, and FARM–Africa. Toward the end of the project period, Awassa and Areka Agricultural Centres were absorbed into the Southern Agricultural Research Institute. The Agricultural, Technical, Vocational and Educational Training (ATVET) colleges established in 2002 were also brought into the project.

Theory of change. Creating more awareness of FPR among government research, extension and education organizations and strengthening their staff capacities to use the approach and relevant tools will lead these organizations to accept FPR and integrate the approach into their regular work — in other words, the approach will become institutionalized.

Approach and process

The project focused on establishing a wide base of knowledge and skills in FPR and creating an enabling environment to apply the approach, to which end it engaged partners in the following areas:

- **Capacity building.** The project conducted courses in PRA, participatory on-farm trials, Training of Trainers, and participatory monitoring and evaluation. It sponsored staff and partners to attend FPR-related conferences and workshops, organized traveling seminars for the students and staff of agricultural colleges, and supported integration of FPR aspects into the curricula and teaching of

Awassa College of Agriculture, and later the ATVET colleges.

- **Field application.** The PRA training was linked with diagnostic studies in the field, based on which on-farm trials were designed and implemented together with farmers. Each partner organization facilitated such on-farm trials to gain hands-on experience in FPR. Technologies tested and proven by farmers were spread by farmer-to-farmer communication and through the government extension system. Later in the project, members of communities where on-farm trials were conducted were encouraged to form farmers' research and extension groups to coordinate the local research and extension activities.
- **Attention to gender.** Gender issues were given attention in the training courses and in field activities. The concerns and interests of both women and men were considered in selecting topics for trials. Women were encouraged to take part in the on-farm trials and the farmers' research and extension groups, for example, to develop less labor-intensive ways of processing enset, the staple food in the region.
- **Awareness creation and mutual learning.** The project organized various events such as seminars and workshops to provide spaces for learning within and among partner organizations. These meetings plus visits to the field stimulated decision-makers to learn more about the FPR approach. Publications, radio broadcasts and other public-relations materials were also used for this purpose.
- **Enabling learning.** The project assisted partner organizations in acquiring small collections of FPR-related publications. It also supported partners to publish their own experiences in FPR. It developed a participatory monitoring and evaluation system as a means to learn from and improve FPR activities. Teams from partner organizations carried out peer reviews and topical monitoring and evaluation exercises for the purpose of learning.

The project trained a total of 1,195 staff members from the partner organizations in PRA, participatory on-farm trials, Training of Trainers, and participatory monitoring and evaluation, through a large number of training events. Among those who were trained, 908 were from the Bureau of Agriculture, 58 from Awassa College of Agriculture, 94 from the Awassa and Areka Agricultural Centres, 58 from the ATVET colleges, and the rest from other organizations. The initial training workshops were intensive and lasted 10–12 days. These were followed by three-day refresher training events to help trainees in applying their knowledge and skills in practice and enabling them to conduct training for others.

According to the project documents, FPR was to be considered institutionalized if the following had been accomplished by the end of the project period:

- Staff members at all levels in the concerned institutions had a clear awareness of and appreciation for the concept and philosophy of FPR.
- The staff had acquired skills and gained knowledge to plan and implement FPR.
- Institutional structures were created that facilitate the incorporation of FPR approaches.
- Adequate resources were made available in terms of skilled staff, funds and logistical support for implementing FPR.
- Effective linkages were created between the relevant organizations and the farming communities so as to enhance coordination and experience sharing.
- Adequate incentives were made available to encourage staff to adopt FPR tools and processes and to develop respect for farmers' knowledge and skills.

Impact

On completion of the project in 2003, an impact assessment was conducted (Opondo et al. 2003). The team consisted of five men; the team leader was Ugandan, while the rest were Ethiopians. Data were collected at the community and institutional levels from five districts in the project's intervention area; 105 respondents at the community level and 103 respondents at the institutional level were interviewed. A variety of techniques, such as key informant interviews, focus-group discussions, and observations, were used to gather and triangulate information. In selecting community respondents, gender and wealth categories were considered. Farmers involved in participatory on-farm trials as well as those not involved were included in the sample.

In 2005, FARM–Africa published a booklet on the experiences from this project in its Project Experience Series, which included mention of impacts at both community and institutional levels (Ejigu and Waters-Bayer 2005). The impacts reported below are based largely on these documents.

Findings from the farmer-led research
The impact assessment did not focus on the findings that emerged from FPR as an approach to farmer-led research. It focused rather on the extent to which the project had institutionalized the FPR approach in governmental organizations. However, it did mention that staff trained in the approach worked with farmers in participatory on-farm trials to test several technological interventions that addressed the farmers' priority problems. Two cases — selection of improved varieties of potato and wheat — were mentioned briefly as examples of how the on-farm trials helped in developing improved technologies that brought better economic benefits to farmers than did the conventional technologies previously introduced by extension services.

More details of FPR as an approach to farmer-led research are given in Case 5.

Impact on farmers' livelihoods
The impact assessment found that the enhanced knowledge and skills of research and extension staff in FPR resulted in positive socio-economic, cultural, environmental and food-security impacts at the community level (Opondo et al. 2003). During the four years of the project, 2,540 farmers in 14 districts were involved in carrying out diagnostic studies, conducting on-farm trials, and taking part in FPR fora and workshops, farmer-to-farmer training, visits, and field days.

The new technologies selected by farmers during on-farm trials led to positive economic impacts such as improved yields. A marginal analysis of using a new disease-tolerant and high-yielding potato variety revealed that, for each Ethiopian birr invested, the farmers could get back almost ETB 25 in value of production (Opondo et al. 2003). The higher income coming from successful trials allowed farmers to invest in productive assets such as oxen.

Some of the technologies adopted as a result of participatory on-farm trials helped fill the food deficit experienced by many households. The adoption of new potato and wheat varieties, for example, led to a twofold increase in crop yield and food availability at household level. Better forms of potato storage made it possible for farmers to plant and harvest earlier, making use of early rains and shortening the period of food deficit. Using new forage varieties improved the draft power of oxen and provided more meat and milk for the households.

Considerable spillover effects in terms of enhanced knowledge and information within the wider community were also mentioned.

Enhanced local capacity to innovate
Through their involvement in on-farm trials, farmers gained the skills and knowledge to experiment with and evaluate different options. They continued to experiment on their own to find solutions to problems they faced, and they ventured into areas of experimentation not covered by the project. The impact assessment report cited the example of one farmer who designed his own experiment to deal with soil fertility on eroded patches of land (Opondo et al. 2003).

Involvement in the FPR process brought about a change of attitude among participating farmers. They became more open to technological change and to working with staff from government extension and research agencies. They also became more confident in bringing in their indigenous knowledge to complement the knowledge of the formal researchers. The impact assessment report referred to farmers who — as a result of their involvement in on-farm trials — adopted new crop varieties and improved production practices. The report also mentioned women who opted for labor-saving technologies such as fuel-efficient stoves.

The project involved men and women farmers from different wealth categories in its activities. According to the impact assessment, women who engaged in on-farm trials increased their capacity to take part in public meetings, identify their problems and constraints in farming, set priorities, and manage trials. Farmers from all wealth categories had equal access to knowledge and technologies, but the benefits they derived were different. Poorer women and men gained mostly in terms of better availability of food, while households in the medium and rich wealth categories could also accumulate assets. Poorer farmers could do only one trial at a time, while richer farmers could carry out several trials simultaneously with different technologies.

Another impact at community level was the formation and good functioning of the farmers' research and extension groups. Joint action by the farmers' research and extension groups led to a stronger sense of togetherness in the community. The groups gave voluntary services in mobilizing farmers to carry out research and extension activities and in linking farmers with government institutions. Ejigu and Waters-Bayer (2005) mention the potential of the farmers' research and extension groups in strengthening farmers' capacities to make demands on government research and extension services.

Impact on formal and informal research and development organizations
The project's main focus was on building the capacity and skills of government extension staff in FPR and thereby creating a conducive environment for integrating the approach within their organizations. The impact assessment focuses separately on each of the governmental organizations that were partners in the project (Opondo et al. 2003).

It found an appreciable awareness and knowledge of the FPR approach in the Bureau of Agriculture. Staff trained in the approach had become competent trainers and were independently training others, not only from within the bureau but also from other organizations. Bureau of Agriculture staff members who had been involved in project activities appreciated the knowledge of farmers and recognized them as equal partners in their work. The Bureau of Agriculture had recognized the importance of participatory planning in extension and had involved communities in joint planning. Ejigu and Waters-Bayer (2005) mention that the Extension Communication Guideline drawn up by the bureau provided sufficient space for participatory approaches. Several districts integrated FPR methods into their three-year strategic development plans and budgets. Bureau of Agriculture staff in some of the districts made plans to disseminate to other districts some of the best practices selected by experimenting farmers.

The impact assessment also looked at the agricultural research centers involved in the project. Here, too, there was increased awareness of the FPR approach among the staff. Many of the scientists had begun to value the indigenous knowledge and innovative ideas of farmers and were willing to work together with them as equal partners in research. They also realized that research programs should be based on the priority problems of the farmers, and that farmers can be engaged in the entire experimentation process. The research centers were using the results of diagnostic surveys to guide the research agenda according to farmers' priorities. The Southern Agricultural Research Institute, which absorbed the Awassa and Areka Research Centres toward the end of the project period, prepared its strategic plan after consulting with relevant stakeholders, including farmers. According to Ejigu and Waters-Bayer (2005), the Southern Agricultural Research Institute allocated part of its own budget to the FPR activities that continued after the end of the project.

The Awassa College of Agriculture and the ATVET colleges had also recognized the importance of FPR and incorporated aspects of the approach into their teaching programs. Senior students had been encouraged to engage in diagnostic surveys to gain a better understanding of farmers' circumstances. They had also been given the opportunity to engage in FPR as part of their senior research projects, with funding from Awassa College of Agriculture. Different elements of FPR had been incorporated into the curricula of various courses. For example, PRA tools and techniques had been incorporated into courses for students of plant science, agricultural extension and

farming systems. The ATVET colleges had planned to include more practical aspects of participatory methodologies in their curricula and hoped to do this during the next curriculum revision at the national level. Teachers and instructors in these colleges had incorporated participatory methodologies and tools to improve their techniques of teaching and interacting with students. The ATVET heads had planned to use their staff trained in FPR to train others within their organizations.

The impact assessment noted stronger linkages between the major stakeholders: farmers, scientists, extension workers, educators and trainers, and government administrators. In fact, this project had been the first opportunity for these different stakeholders to work together and to recognize their complementary capacities. The stakeholders had developed more positive attitudes toward each other. The "Research-Extension-Farmer Linkage" strategy developed by the Southern Agricultural Research Institute was supposed to continue to support linkages among the different stakeholders.

Summary of lessons learned

Lessons drawn by the documents

Institutionalization is a complex process that requires change in individuals, and through them, in their organizations. This is a long-term process of capacity building and organizational change. It involves multiple institutions with different cultures, regulations and procedures, working and learning together. Change has to take place throughout the entire organization, not just at the grassroots level and the top. Although the project made good progress according to the indicators it had set for itself, four and a half years was too short a time to actually accomplish such an institutionalization process.

Facilitating a complex institutionalization process calls for flexibility in dealing with changes in the external environment. In this case, the dynamics of the administrative restructuring in Ethiopia had not been sufficiently well foreseen during project planning. The project had to invest additional efforts to deal with the new structures and staff. The project was also not sufficiently prepared to deal with rigid and bureaucratic procedures, particularly of financial management in the partner organizations, which often delayed the work and constrained the flexibility and responsiveness required to support FPR activities.

A participatory approach calls for continued learning among all those engaged. Training and coaching of individuals alone is not sufficient. Spaces should be created for these individuals to share their experiences and to learn from others. The FPR fora set up by the project gave individuals such a space for reflection, peer review and mutual learning.

Strengthening community organizational capacities is very important in institutionalizing FPR at the grassroots level. This aspect was not considered during the planning of the project. It was only in the course of the project that partners realized the importance of establishing and strengthening farmers' research and extension groups as community organizations. However, in the brief time up to the end of the project, it was not possible to provide adequate support to make these groups strong enough to continue on their own.

Lessons drawn by the study team

The impact assessment was done immediately after completion of the project. An assessment five to 10 years later would have provided a more realistic picture of the status of institutionalization of the FPR approach and whether and to what extent it had impacted farming communities.

Most donors are interested in supporting projects that bring high returns to investment in a short time. Considering that institutionalization of farmer-led research approaches requires sustained support over a longer period, longer funding cycles with differentiated funding arrangements would be more effective.

Sources of information and data

Project or NGO documents

Ejigu J and Waters-Bayer A. 2005. *Unlocking Farmers' Potential: Institutionalising Farmer Participatory Research and Extension in Southern Ethiopia.* Project Experience Series 2. London: FARM–Africa. Retrieved from www.prolinnova.net/sites/default/files/documents/resources/publications/2005/ifpr.pdf

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External evaluation report

Opondo C, Bediye S, Tesfaye A, Bedada F, Mazengia W and Ejigu A. 2003. *Impact Assessment of the Project IFPR in SNNPRS, Ethiopia.* Addis Ababa: FARM–Africa.

NOTES

[1] PROLINNOVA: PROmoting Local INNOVAtion in ecologically oriented agriculture and natural resource management; the international secretariat is hosted by the NGO ETC Foundation in Leusden, The Netherlands.

[2] Referring to cases in both the long (Annex F) and short list (Annex G) but not including the many other people who responded to the call for cases.

[3] Cases 12 and 13 could not be included in the final list, as sufficient information on impact could not be found in time.

[4] The study focuses on smallholders engaged in both subsistence and commercial production.

[5] The review team is aware that it may not be possible to glean all of this information from the available documentation but will include the information to the extent possible.

[6] Those factors that can be identified from the desk review of impact analysis information.

[7] It seems that one of them, Yacouba Sawadogo, was inspired by his visit to Mali facilitated by an NGO.

[8] See list in Kaboré and Reij 2004.

[9] See examples in Sawadogo 2006.

[10] For example, Ouédraogo and Kaboré 1996; Ouedraogo and Sawadogo 2000; Reij and Waters-Bayer 2001; also C. Reij, personal communication, 2014.

[11] See Case Study 4 and Bunch 1982.

[12] The six classic participatory technology development steps are described in Holt-Giménez and Crus Mora 1993.

[13] "MASIPAG farmers" in the rest of this document refers to fully organic farmers.

[14] Source: www.masipag.org

[15] Source: www.masipag.org

[16] Source: www.masipag.org

[17] FARM–Africa: At the time of the project, the acronym FARM stood for Food and Agricultural Research Management. The organization now calls itself Farm Africa.

[18] The report notes that these calculations do not include the costs of pesticides, although one would expect these to have been used by farmers.

[19] The approach is described in Jacolin et al. 1991 and Dupriez 1999.

[20] The evaluators used half the number of beneficiaries stated by the Diobass Burkina Faso team and stated that they were not able to determine how many farmers were actually reached through the work of Diobass.

[21] Referring to Braun A, Jiggins J, Röling N, van den Berg H and Snijders P. 2006. *A Global Survey and Review of Farmer Field School Experiences*. Nairobi: International Livestock Research Institute Retrieved from www.share4dev.info/ffsnet/output_view.asp?outputID=1880

[22] "Kuturaya" was the word the farmers used to refer to "research," particularly to the experimentation and learning process that was central to the participatory extension approach.

[23] An exception is perhaps the document that became available after the draft report on this study was completed: Chuma and Hagmann 1995.

[24] AISP III: Third phase of German-funded Agricultural Input Supply Project.

[25] www.agridea.ch

[26] https://assets.helvetas.ch/downloads/001_psard_ii_2013_en.pdf

[27] Outcome mapping is a methodology promoted by the International Development Research Centre for planning and assessing development leading to social transformation. It provides a set of tools to gather information on the behavioral changes (outcomes) in the change process. Outcome mapping helps program staff to think systematically about what they are doing, to learn about how they have influenced change in their partners and to adapt strategies to bring about desired outcomes (www.outcomemapping.ca).

[28] For example, Schulz 2000.

[29] Source: http://en.wikipedia.org/wiki/H%C3%B2a_B%C3%ACnh_Province#Demographics

[30] Partly based on Boi et al. 2007.

[31] FARM–Africa: At the time of the project, the acronym FARM stood for Food and Agricultural Research Management. The organization now calls itself Farm Africa.

[32] "Southern Nations, Nationalities and Peoples Regional State (SNNPRS)" is the official name of this state in Ethiopia; elsewhere in this document it is referred to as the "Southern Region."

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Contact Details:
CGIAR Research Program on Aquatic Agricultural Systems
Jalan Batu Maung, Batu Maung, 11960 Bayan Lepas, Penang, MALAYSIA
www.aas@cgiar.org

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