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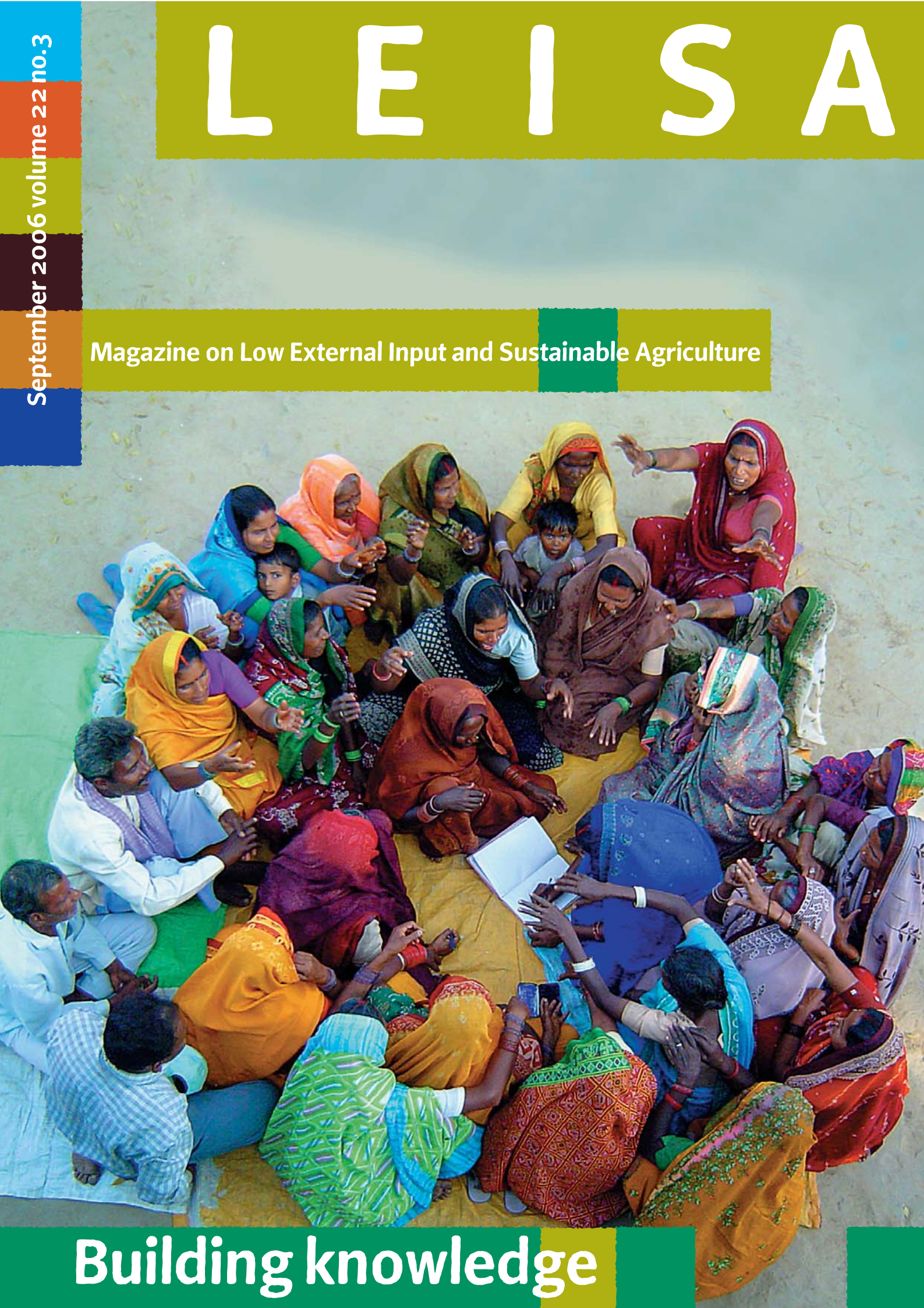
LEISA

Magazine on Low External Input and Sustainable Agriculture



Building knowledge

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LEISA
Magazine on Low External Input and Sustainable Agriculture
September 2006 Volume 22 No. 3

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Cover photo
Men and women discuss agricultural issues at a community meeting in Dudhai, Sardarnagar, Uttar Pradesh, India. Photo by S. Jayaraj, courtesy of Gorakhpur Environmental Action Group (GEAG).

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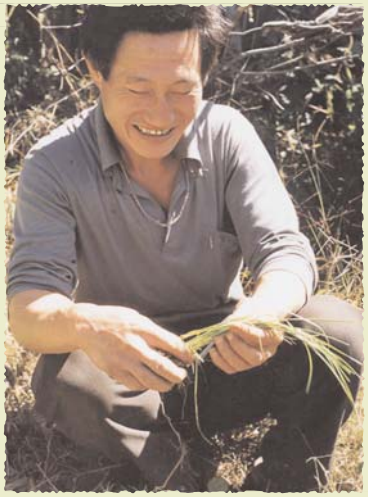
Correction: On p.20 of the last issue we mistakenly stated that Dar es Salaam is the capital of Tanzania. In fact, the capital is Dodoma. Apologies to all concerned.



LEISA is about Low External Input and Sustainable Agriculture. It is about the technical and social options open to farmers who seek to improve productivity and income in an ecologically sound way. LEISA is about the optimal use of local resources and natural processes and, if necessary, the safe and efficient use of external inputs. It is about the empowerment of male and female farmers and the communities who seek to build their future on the basis of their own knowledge, skills, values, culture and institutions. LEISA is also about participatory methodologies to strengthen the capacity of farmers and other actors to improve agriculture and adapt it to changing needs and conditions. LEISA seeks to combine indigenous and scientific knowledge, and to influence policy formulation in creating an environment conducive for its further development. LEISA is a concept, an approach and a political message.

ILEIA is the Centre for Information on Low External Input and Sustainable Agriculture. ILEIA seeks to promote the adoption of LEISA through the LEISA magazines and other publications. It also maintains a specialised information database and an informative and interactive website on LEISA (**www.leisa.info**). The website provides access to many other sources of information on the development of sustainable agriculture.

16 From piloting to scaling up

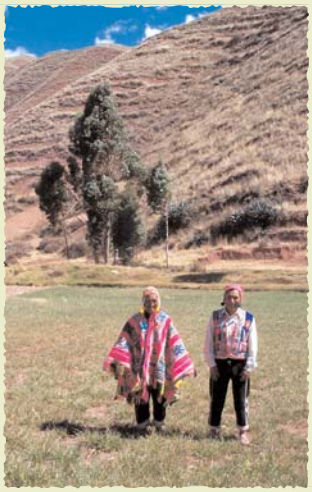
Dindo Campilan, T.L. Lama, S.R. Ghimire and Oscar Hidalgo

Potato is an important food crop in Nepal. But average yields are very low, and successful production faces many difficulties: bacterial wilt disease, for example, can result in losses of up to 90 percent. In 1993, UPWARD started a research project aiming to help farmers manage this disease, recognising that technical solutions alone are not enough. So an integrated, community managed strategy was piloted, with interesting implications and results for the community involved. Since then, further efforts to scale up the learnings have employed the Farmer Field School approach. By involving the national government and different NGOs, these efforts have been successful in reaching more farmers.

32 The Kamayoq in Peru: farmer-to-farmer extension and experimentation

Jon Hellin, Carlos de la Torre, Javier Coello and Daniel Rodriguez

One of the most effective ways to address farmers' needs is through a farmer-to-farmer extension approach that also encourages farmer experimentation. This is clear from Practical Action's work in Peru. The *Kamayoq* are farmers selected by their communities, who receive specific training and then return to their villages to train neighbouring farmers. They work with other farmers to develop solutions to local agricultural and veterinary problems, generally following a Participatory Technology Development approach. Positive results also include an increase in self-confidence among the *Kamayoq* and those working with them, something which further encourages local experimentation.



DEAR READERS

We are very pleased to present this issue, which stresses the importance of building knowledge for LEISA and also shows some of the different initiatives in participatory research, experimentation and innovation currently taking place. The starting point for this issue was the publication "Participatory research and development for sustainable agriculture and natural resource management: A Sourcebook" compiled by UPWARD (Users' Perspectives With Agricultural Research and Development) and partners. We are very grateful to Dindo Campilan and his team for the initial help and discussions which informed the development of this issue's theme. During the last three months, many people shared their ideas and sent us contributions from all over the world, which helped us to develop our ideas further.

We are also happy to contribute to the process of building and exchanging knowledge by presenting the CD Rom which is enclosed with this issue. All the articles ever published in the *LEISA Magazine*, as well as all the articles published by our partners in the regional editions, are available on it. This amounts to nearly 3000 articles, in 5 different languages, all of which are easily accessible. Please share this with your colleagues and friends, and invite them to join the more than 40 000 subscribers of the LEISA magazines worldwide. Good reading!

The Editors

Building knowledge

Editorial

Small-scale farmers continuously adapt their practices, as a result of their observation, collaboration, experimentation and innovation, activities which all contribute to their body of knowledge. Knowledge can be described as the result of perception, learning and reason. In this issue of the *LEISA Magazine* we look at how knowledge about LEISA concepts is currently generated, shared and used by a variety of people working towards improved livelihoods in rural areas. We argue that the generation of knowledge is a process which is and needs to be ongoing, but that further steps also need to be taken to exchange, make the knowledge available to all, and most importantly, to act on this knowledge.

The concept of LEISA is constantly being developed, as are the practices within LEISA systems. All those involved with its development and daily implementation are continuously seeking newer and better ways to improve their production and livelihoods. LEISA is not only about technical issues, but also about the empowerment of farmers, social fairness and economic viability, so its development might refer to improved technical options, new social organisations or better access to credit. Small-scale farmers and their families have always had to adapt in all these spheres, and as a result they have for centuries been responsible for the development of local practices well suited to their environmental and social context. Today, however, physical, social and economic circumstances are changing faster than ever, the competition for resources is increasing, and local adaptation is not enough to keep pace with these changes. In complex rural environments, farmers are facing changing rainfall patterns, lack of access to markets, and increasing demands from the effects of globalisation. In these situations it is even more necessary to be able to constantly build and improve knowledge, gain access to new information and knowledge, and use these to adapt improvements to suit local conditions, and deal with the changing world.

Building on previous ideas

In the last twenty years or so, much effort has been made in trying to change research and development in agriculture to better involve farmers, to the extent that this is now widely accepted. However, most formal research related to agriculture in developing countries is still carried out at large research institutions, and the extent to which farmers are involved in setting the agenda, in taking part in experiments, or in monitoring, evaluating or using the results varies a lot, but is generally very limited. The vast range of participatory approaches and methods promoted in the last twenty years have aimed, in general, at building technical knowledge in order to improve livelihoods (e.g. PRA, PTD). But in spite this common aim, there is still a gap between accepted theory and current practice. Although there have been improvements in communications and infrastructure there are still various difficulties in relation to research priorities, access to information, knowledge generation, validation and sharing, faced by small-scale farmers. Where successes are seen, they are often very localised or happen in isolation. Wilkes *et al.* (p. 9), for example, found that successful experiments by individual households "…did not necessarily lead to spread of knowledge and skills within the community". If this is the case at community level, then much greater effort would be needed to get such information out to others, scale up and create a body of useful knowledge.

It is an interesting exercise to think about which of the articles in this issue could have been written twenty or more years ago. Some "new" ideas and practices have now become widely accepted, other concepts are important enough that they constantly need repeating, while the focus of other areas of thinking has changed and developed. The articles in this issue give examples of some these cases.

Effective approaches

Effective research and development approaches for low external input agriculture are based on making effective use of indigenous knowledge, optimal use of local resources, and linking and working together as organisations or individuals, in order to access other resources and types of knowledge. Examples of this can be seen in the articles by Piniero *et al.* (p. 12) and Lundy (p. 18) or Bakewell Stone (p. 30) Additionally, research and development should and can be based in farmers' expressed priorities and needs, and be multi-disciplinary in order to be relevant to farmers daily realities. Participation by farmers at all stages of the research and development process is the ideal situation. But in practice, there are still many difficulties and gaps, especially when considering the complex relationships between all the actors involved in research and development processes. Often this is related to power, depending on who is in a position to set the research question or agenda. Another important factor is funding, as donors may have their own agenda, or smaller informal organisations may not be able to access funds. In addition, who participates, and the reason they do so may also affect the process. These various relationships of power may affect the outcome and applicability of the research. Research agendas set by outsiders normally differ from farmers' priorities. Hellin, Bellon and Badstue (p. 6) examine these and other points, stressing the difference between research which is functional and that which aims to be empowering, within the context of an international research institution. The articles from Okry and Van Mele (p. 14) and Araya and GebreMichael (p. 28) give interesting insights into the different priorities of farmers, scientists, and extension workers, not to mention the young, old, men, women and those with more or less experience. They show the different perceptions and reasoning behind the choices and priorities given to new, local and modern ideas by different stakeholders. This shows that participation can be a complex issue, but that it is essential at many levels and stages in the development and scaling up process.

Contribution of farmers' innovations

Today, many organisations recognise and are working to document and support the development of farmer innovations, which goes a step further than just encouraging participation in research. This acknowledges that farmers' own experimentation is a valid starting point, perhaps more so than when the research agenda is set by others. Until now, farmers have rarely been recognised as innovators, nor have their improved practices been seen as innovations. This was shown by Ruth Tagoe (p. 35) when she had to look for men and women doing "something new" rather than referring to "innovations". The fact that farmers innovate and experiment is not new, but it is only recently that increased awareness from others has led to a general recognition of what they do as "innovating", which also gives value to their daily experimentation. For example in Araya and Edwards (p. 40) the farmer says "I was called 'an innovator' by the local agriculture experts", which shows that even the farmer did not think of himself as an innovator.

This article also presents an interesting example of the motivation behind innovation, and that one success will often inspire another. It is said that "necessity is the mother of invention", meaning in our context that where farmers perceive a problem they will work to solve it. The article by Janev (p. 26) also highlights the lack of awareness in some circles about the term "innovation", but demonstrates that anyone and everyone can be an innovator. In this example, those who have taken up farming also bring knowledge from previous experiences to assist in improving practices and technologies. Once innovations and innovators are recognised, a next step can be to examine how best to support these processes, and look at the use of information and the role of outsiders in strengthening, validating or scaling up as relevant.

Redefining roles

The increased emphasis on participation and farmer innovation requires a re-examination of the roles of all the actors involved in small scale agricultural research and development. If farmers are increasingly empowered to contribute to the research agenda, or work as extension agents and be involved in research and scaling up (see Hellin *et al.*, p. 32), then the roles and potential contributions of outsiders will need to be reviewed. New relationships need to be built on the basis of these new understandings, and the balance of power should also shift. Currently, there is greater emphasis on working in partnerships, building linkages and finding ways for farmers, communities, researchers, NGOs, or the private sector to work together for everyone's benefit. If such a variety of stakeholders, with their equally different priorities, agendas and power structures, are willing to work together, this trend can be seen as positive. It will mean a significant change in attitudes and outlook, especially from those who have traditionally been in positions of power. Future changes and improvements in working practices will need to be based on this shift in thinking, and build on the progress which is currently being made. This broadened vision, of development efforts benefiting from people and organisations working together in networks, also reflects the recent thinking that innovation is not just in the technological sphere, but also refers to new ways of sharing learnings or working together, in terms of social, economic or institutional innovations. This is one definition of Participatory Innovation Development, which has broadened the scope of Participatory Technology Development (see Lutalo and Critchley, p. 24). The institutional context in which technological change occurs is crucial, and therefore it is important to recognise the wider context, which the concept of LEISA embraces.

Progress

In July 2000, our issue entitled "Grassroots innovation" highlighted farmer innovation and efforts to support and promote participation, extension and experimentation. It is encouraging to see that some of the ideas presented in that issue have been further developed. Progress has been made in raising awareness about the importance of farmers' participation, local knowledge and innovation, as reflected in the articles that we present here. In recent years there has also been a rise in what is known as "knowledge management", along with "knowledge centres" staffed by "knowledge specialists". This shows how the thinking and practice is moving forward, but there is still work to be done. The next steps will include validating, exchanging and institutionalising the recent progress, practices and the theories on which they are based. We will also need to focus more on supporting the building, generation, exchange and use of knowledge for LEISA. By broadening the availability of knowledge and empowering people to participate in its generation, small-scale farmers will benefit through having options and information available, which will empower them to ask the right questions, make sound decisions and create and develop their own body of knowledge. If knowledge is power, then joint building and acting on this knowledge is empowering.

■

Photo: S. Edwards

Experimenting with watering methods in Ethiopia.

Bridging the gaps between researchers' and farmers' realities

Jon Hellin, Mauricio Bellon and Lone Badstue

Photo: CIMMYT

Farmers identified a number of desirable traits in maize.

The Green Revolution, and more recent work on agriculture and rural development, has led to increased yields in developing countries of a number of crops, including maize and wheat. International agricultural research organisations, such as the International Maize and Wheat Improvement Center (CIMMYT), together with their national partners, played a key role in this process by developing improved crop varieties that spread rapidly in tropical and subtropical regions. The uptake of improved varieties has, however, been greater in areas with good irrigation systems or reliable rainfall. One of the reasons is that farmers living in more marginal areas are commonly faced with a range of adverse agro-ecological, social and economic conditions, including unreliable rain, low fertility soils, fluctuating market prices for agricultural products, and labour shortages. In this context, modern crop varieties (even if they are high yielding) may not be attractive to farmers unless they also possess other characteristics that farmers consider important. Maize is a good example of this, having been cultivated for approximately 6000 years in Mexico, a centre of origin. Maize stalks are used for fencing, husks for wrapping hot food and leaves for fodder. In marginalised areas, farmers also value adaptation to low soil fertility, drought, resistance to pests and diseases, and storability of grains and seed.

Science has a lot to contribute to agricultural development: farmers are eager to learn of new options and solutions to their problems, but in many cases do not have information about or access to them. For research to contribute to poverty reduction and greater livelihood security, the emphasis must be on the application of appropriate knowledge, rather than merely developing it. In order to make the products of the research process more relevant to the needs of smallholder farmers, research organisations are increasingly engaged in participatory research, whereby the research and technology development process focuses on and closely interweaves with the practical application of appropriate knowledge in real-life situations. Over the last 35 years, and in particular since the early 1990s, interest in participatory crop research and improvement has grown in recognition of its potential contribution to marginal areas with low agricultural potential. There is a need to identify crops and varieties that are suited to a multitude of environments and farmer preferences.

The participatory process involves narrowing the gap between research organisations' and farmers' realities by ensuring direct farmer involvement at different stages of the research process. There are two main purposes for which participatory approaches are normally used in the field of development research:

- Functional purposes, in order to increase the validity, accuracy and particularly the efficiency of the research process and its outputs. Functional purposes can, in turn, be divided into ones that inform, for example, plant breeders of the traits that they should be incorporating in improved varieties, and ones that cover farmers' ability to manage better existing and new crop varieties;
- Empowerment purposes that enhance farmers' capacity to seek information, strengthen social organisation, and experiment with different crop varieties and management practices. Empowerment also includes strengthening the capacity of NGOs and extension services to work more effectively with farmer organisations.

One of the challenges is to identify the comparative advantage of research organisations when it comes to participatory research: should research organisations attempt to cover both the functional and empowerment purposes of participatory research? Specifically, we need to consider:

- Under what circumstances is it reasonable to expect participatory research projects to have a direct impact on farmer empowerment?
- Should farmer empowerment be a primary objective of research organisations engaged in participatory research?
- Should research organisations focus more on the empowerment of partners such as national agricultural research and extension organisations?
- Should research organisations engaged in participatory research focus primarily on the functional purposes of that research and if so, should the emphasis be on informing breeders of the traits valued by farmers and/or enhancing farmers' ability to manage local and improved varieties?

These are critical questions when it comes to identifying the most cost-effective ways for establishing links between scientific and local knowledge so as to generate more relevant research. CIMMYT's experience with participatory crop research in Mexico provides some answers to the above questions.

Participatory maize research in Mexico

CIMMYT carried out participatory crop research in the central valleys of Oaxaca in southern Mexico, an agro-ecologically and ethnically diverse region recognised as being within the centre of maize genetic diversity. Farmers in this region have a long tradition of cultivating maize and have maintained a diversity of local maize varieties. These varieties have considerable value for agriculture because they have contributed to the development of improved, drought-tolerant maize varieties that are popular elsewhere in Mexico and in other parts of the world.

Modern maize varieties have had an almost negligible impact in the central valleys, and while their virtual absence may or may not have helped to conserve maize diversity in the region, it indicates that scientific research has not provided farmers in this region with new varieties that address farmers' needs. The objectives of the research carried out by CIMMYT were to examine the possibilities of maintaining or enhancing genetic diversity by increasing the benefits from growing local maize varieties while simultaneously providing scientists with information on the traits valued by local farmers.

The project included a participatory study of regional maize landrace diversity. This included the recording of local crop and soil taxonomies, and the collection and planting of different types of maize. Based on farmers' votes, the project selected a subset of 17 different maize varieties, spanning a wide range of the regional maize genetic diversity. Farmers were able to learn about each variety's performance at different stages in the crop cycle. Anyone who wished to do so could buy seed of the varieties that interested them and plant it in order to compare the material with their own local varieties under their own production conditions and management. The project also organised training sessions on maize reproduction along with seed and grain storage: different technologies were introduced, including a simple metal silo for storage, a technology little known in the area.

Through this research project farmers gained access to seeds and information about a range of maize diversity present at the regional level. A considerable number of farmers welcomed this opportunity. The training on maize reproduction, seed selection and management motivated some of them to try new management and storage techniques. Male and female farmers were trained in seed selection and storage practices, conducted experiments and gained access to new storage technology. Farmers who evaluated a selection of the 17 varieties in comparison with their own local ones verified that the "experimental" maize types worked well under their circumstances, and some were even considered to be better than some of the local maize varieties.

Farmers reported that they valued the training sessions and as a result they felt more motivated to try new management and storage techniques. In several cases, participating farmers had not been familiar with certain aspects of maize reproduction. While farmers knew that pollen from one plant had an impact on another one, most of them did not think of this as a sexual reproduction process. Many of the techniques for maize improvement can only make sense if one understands maize reproduction as a sexual process. Once understood as such, several farmers were keen to try new management techniques. The silos for seed and grain storage also proved to be very popular with local farmers.

Meanwhile, the project contributed substantially to scientists' understanding of local maize agriculture and shed light on some of the traits that scientists should be focusing on in future crop breeding programmes. The research yielded important insights and large amounts of data regarding local maize agriculture and maize-based smallholder livelihoods, especially local seed selection and seed management practices, farmers' knowledge of maize reproduction, and the importance of consumption characteristics. In this regard, the results of this research contributed significantly to the improved understanding of the mechanisms of local crop genetic resource management in a broad sense, those who are involved in it and the challenges they face.

The project assisted researchers in CIMMYT to identify key traits that can be the focus of crop breeding programmes**.** Farmers mentioned a large number of desirable traits, which can be divided into three categories: agronomic (including yield stability, drought tolerance and resistance to pests and diseases), consumption-related (quality issues related to local maize preparations such as tortillas and local maize-based drinks) and economic, such as the grain characteristics that meet market demands.

This improved understanding of farmers' use and management of local crop genetic resources, in turn, has served to inform and guide further research both by national and international institutions, and has served as reference for development

Photo: CIMMYT

A study of regional maize landraces included the recording, collection and planting of different types of maize.

practitioners, academia and policy makers. Moreover, it has yielded important insights into different options for on-farm conservation of crop genetic resources. At the same time it has brought attention to a series of issues that are of importance from a farmer point of view in relation to maize and maize agriculture, and which may have important implications for the design and feasibility of further research or development interventions.

Participatory research: what role for agricultural research organisations?

The participatory crop research in Oaxaca was successful in terms of its functional and empowerment purposes: the interaction with farmers provided maize breeders with invaluable information on the traits that are of local importance. Farmers, in turn, learnt about maize reproduction and post-harvest storage, thus enhancing their ability to manage existing and new maize varieties. The Oaxaca

example also demonstrated that while the participatory research benefited scientists, only a relatively small number of farmers, albeit several hundred, actually benefited directly.

This should not come as a surprise: most participatory research initiatives carried out by research organisations do not have the sufficient presence on the ground, and do not involve the required interaction with farmers, to generate and support direct empowerment of more than a relatively few farmers. This would necessitate a longer-term and more direct interaction with farmers than that usually associated with how research organisations operate (many research projects only last between 3 - 5 years). In addition, the impacts of most participatory research carried out by research organisations on farmers' innovation capacity and livelihoods are seldom sufficient, in themselves, to justify the expenditure of the research process.

Photo: CIMMYT

Participatory research initiatives carried out by research organisations often have insufficient presence on the ground, and do not involve the required interaction with farmers.

The most effective way for participatory research processes to benefit a greater number of farmers is by close coordination and collaboration with organisations that are better placed to link farmers and researchers due to their relatively long-term contact with farmers. These organisations can include extension services, farmer organisations and NGOs. As these organisations focus on development rather than research, they are better placed to ensure that research results reach greater number of farmers and that in the process more farmers are empowered. Research organisations, therefore, need to give more attention to the empowerment of partner organisations: sharing with these organisations the insights and improved varieties generated by the targeted participatory research process.

Make objectives clear

Participatory crop research and improvement can undoubtedly contribute to improved understanding of farmers' crop genetic resources management, and lead to better targeting of research and policy as well as practical recommendations for development interventions. The benefits of using participatory approaches in agricultural research are first and foremost their ability to bring to the research process new and important perspectives. These can help to achieve:

- Quicker and more widespread diffusion of technologies better suited to farmers' needs;
- Better targeting of research and technology development;
- Lower costs of technology development;
- More efficient extension; and
- More appropriate policies.

At the same time, participatory research is also likely to contribute to local capacity building and, in the case of the individuals who take part in the process, to greater self-confidence and increased knowledge**.** However, unless the research process involves strong components of applied development interventions, or takes place in close coordination with practical development interventions (e.g. action research), the potential for impacts in terms of empowerment should be expected to be limited. Hence, rather than being a direct causal agent of actual empowerment and innovation at the farmer level, the role of participatory research may be principally to produce information, test methods and approaches, which in turn, feed into the generation of empowerment tools and initiatives. Meanwhile, others actors such as government or NGOs, have comparative advantages in relation to the role as direct causal agent of empowerment processes.

In summary, while both the functional and empowering purposes of participatory research are desirable and important, one should be clear about the principal purpose of using participatory approaches in any particular situation, whether primarily to improve the efficiency and the impact of agricultural research, or primarily as a means for empowerment of farmers as a worthwhile development outcome in itself. This choice has important consequences for how we target participatory research and measure impacts. ■

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Photo: Yu Hua

A farmer explains his fodder storage methods to other villagers.

Improving service delivery in Yunnan, China

Andreas Wilkes, Shen Shicai and Huang Yulu

The Center for Biodiversity and Indigenous Knowledge (CBIK), a Chinese NGO, has been promoting participatory approaches to technology development and extension in the animal husbandry sector in Gongshan County, Yunnan, China. Here, villagers' livelihoods are based on mixed farming or agro-pastoralism where livestock has a central role. But all villages experience problems in animal raising which increase the costs and risks of livestock production. Although many practical technologies exist which could be helpful to farmers, these are not known of or adopted by both farmers and technicians. Many technicians had a poor understanding of villagers' needs, and existing extension efforts lacked continuity; technologies often being demonstrated for one year with no follow-up the following year, and although adoption rates were low there was little systematic assessment of the reasons why.

PTD in Gongshan County

In 2003 CBIK began to implement the "Enhancing Agro-pastoralist Livelihoods in north-west Yunnan" project. To address the problems faced with livestock and extension, the project included a Participatory Technology Development (PTD) component. PTD is a people-centered approach to promoting development based on local capacities and resources. The core of PTD is joint experiments involving technicians and villagers. Experiments are targeted at villagers' problems and needs, and villagers are involved in the whole experiment process, including the extension of useful technologies. The aim of PTD is to produce locally suitable and relevant technologies, as well as supporting relevant stakeholders to be better able to engage in local processes of technological innovation. PTD requires a range of skills – including technical skills, facilitation and communication skills, and analytical skills. For leaders of the township and county animal husbandry officials, PTD also requires leadership and organisational management skills. Learning to apply these skills effectively requires a long process.

Initially, the purpose of introducing PTD approaches in this context was to resolve technical issues in animal husbandry in the villages. However, as our work progressed, it became clear that participatory approaches also induce processes of learning among technicians and officials about a range of issues, including technical and interpersonal skills and problems in organisational management. We have learned that PTD can contribute to the organisational reorientation of service delivery agencies. This article describes how this process of learning was brought about.

Facilitating farmers' experiments

When the project began in 2003, a meeting attended by CBIK project staff and staff of the county Animal Husbandry Bureau (AHB) was held, at which the PTD approach was described and discussed. In order to identify issues which villagers were interested in working on, six CBIK staff and one county technician spent two weeks in Dimaluo village, using rapid appraisal methods to understand livelihoods and issues in livestock raising, and holding meetings with community members. The team learned that almost all households face a shortage of fodder in winter, and that livestock diseases result in significant losses each year. So experiments were agreed, focusing on fodder technologies (exotic grass species and silage

fodder) and preventive medicines for poultry diseases. In June 2003, 36 villagers volunteered and were chosen to take part in the experiments.

All experiments were conducted by the farmers on their own land or using their own fodder resources. No subsidies for involvement were paid, as those who took part had expressed interest and motivation of their own. For exotic grass species experiments, CBIK agreed to provide seed to cover only three square meters, to reduce the risk to farmers if the introduced grasses proved unsuitable. Apart from this, the location, timing and all other aspects of the experiments were decided by the farmers themselves. CBIK staff – and initially one county technician – visited and interviewed the experimenting farmers each month to learn what changes had taken place, how the villagers understood and explained these changes, the outputs the technologies were producing and villagers' assessments.

Photo: Gao Zhixiong

Technicians discussing the establishment of a revolving fund with villagers after a successful experiment with preventive medicines for animals.

Soon after the monitoring work began, the participation of the county technician decreased. County technicians and officials thought that the scale of the experiments was too small to have any impact. They were more interested in planting large 'demonstration' plots which could be used to show both villagers and visiting officials the benefits of fodder grasses. This is the usual way the government agencies encourage superior officials to give more project funds. The county technician also felt that it was unnecessary to interview the villagers so often, explaining that, according to his experience, many villagers do not tell technicians the truth and will say one thing to their face, but another behind their back.

From CBIK's point of view, the experiments showed that (at least some) farmers were interested in and capable of doing technology experiments. An evaluation of the experiments found, however, that even though an individual experiment might be successful, and that the experimenting villager might be able to master a technology, other villagers did not necessarily know the results of the experiment. So experiments by individual households did not necessarily lead to spread of knowledge and skills within the community. Similarly, an evaluation of a large AHB demonstration plot, found that even though many villagers knew about the plot, they did not know the result of the experiment taking place and would rarely ask those who had been involved.

Learning to collaborate

In spring 2004, the township veterinary station near Dimaluo village – which had not been involved in the first year's experiments – approached CBIK staff saying that they had heard about the successes of the first year's work and were interested in learning how better to work with the farmers. They explained that the township staff were all young and recently graduated from technical college, and they were therefore interested in putting the skills they had learned in college into practice, thereby improving their technical skills as well as learning how to work with farmers.

In order to deal with the problem of information flows within the community, the project decided to work with groups of experimenting farmers instead of individual households. Following the participatory surveys, Villager Experiment Groups (VEGs) are set up. Each group focuses on a different aspect of animal husbandry. Villagers take part in these groups on the basis of their own interest and after being nominated by the community in a community meeting. The groups design their own experiments with the support of the township technicians and then implement them. Each month the technicians facilitate the sharing of experiences and experimental findings at a group meeting. When the members of the group feel that the experiment has produced clear results, they summarise their results and let other villagers know what the results have been. If the experiment has been successful, they make a plan to get sustainable access to the material required and for spreading the knowledge and skills required among the villagers.

In June 2004, three Villager Experiment Groups were set up in one pilot village: a poultry disease prevention group, a fodder group and a pig breed group. Each month, the township technicians convened a meeting of each group and discussed the progress of the experiments. Through six months of experiments the technicians improved their understanding of production conditions in the village and the issues villagers are concerned with in livestock raising; improved their abilities to communicate effectively with and organise the villagers; and also learned about the use of various technologies under real production conditions.

After six months, some of the experiments came to a successful end, but it proved impossible to proceed into an extension phase. One example concerned experiments on the impact of inoculations (against Newcastle's disease and bubonic plague) on poultry survival rates. Although the results of the experiment had been very clear – participating households had high survival rates, while non-participants did not – the county veterinary station had run out of its stock of vaccinations, and it would be months before the next stock would be bought in. This example revealed that a successful collaboration with the villagers also required continual support from the county agencies, but that existing management arrangements were not likely to bring this support about.

Learning to change

Every three months, the township station wrote a report on the experiments' progress, and oral presentations were made by the township veterinary station head to county officials. The head of the county AHB was most impressed by the improvements in

Table 1: Stages in the learning process 2003-6

Period	Main activities	Changes in relationships	Changes in service providers' concerns
Pre-project	Infrequent and ineffective extension activities	• Little cooperation between townships and villagers • No formal mechanisms for partnerships	• How to fund organisation through applying for project funding
2003-4	CBIK facilitate experiments in 1 village (12 hamlets)	• Little involvement of township or county; • CBIK works with villagers and attempts to 'bridge' villagers and county	• How to use experiments to secure more project funding
2004-5	Township facilitates experiments in 1 village (2 hamlets)	• Township begins formal collaboration with villagers • CBIK supports township	• How to collaborate effectively with villagers
2005-6	4 townships facilitate experiments in 4 villages (8 hamlets)	• County supports township to collaborate with villagers • CBIK supports county and township	• How county can support township • How to clarify county roles and support improved service provision

grassroots technicians' technical, organisational and writing skills. In June 2005 the county AHB invited CBIK to support a similar learning process for three other township veterinary stations. In August 2005, CBIK provided training for township and county staff on PTD, and accompanied township technicians to undertake participatory surveys and establish experiment groups in pilot villages in each township.

The surveys revealed many common problems throughout the county, such as slow growth of pigs, lack of winter fodder and the prevalence of disease and mortality among pigs and poultry. Experiments with off-the-shelf technologies were designed and implemented in each pilot village. The survey and experiment process raised several issues. In addition to the stocking of poultry vaccinations by the county veterinary station, it was realised that vaccinations were only available in bottles sufficient for 300 birds – much too large for cost-effective use in the small hamlets in the county, but the county veterinary station had no alternatives to suggest. Another issue was the weak skills of grassroots staff in disease diagnosis.

By late 2005, the county animal husbandry bureau began to seriously consider how it could provide better support to the experiment processes in the villages. At a technical level, it was clear that the grassroots technicians needed support with diagnosis. The county has begun to implement several measures, including: facilitating experienced vets at the county level to provide training and consultation on specific cases to younger colleagues at the township level; using the newly established county animal health laboratory, not only to meet state epidemiological reporting requirements but also to meet the needs of the grassroots technicians for diagnostic support; and developing a system by which results of epidemiological and case monitoring can feed into decisions on the stocking of vaccinations and inoculations at the county veterinary station. The county veterinary station is now actively seeking information on suitable technologies outside the county.

These changes require new mechanisms for collaboration between county and township service agencies. A bi-monthly county and township station leader's meeting has been instituted at which township veterinary station leaders can voice their needs, and county station leaders can exchange their information, needs and plans. The county and township agencies are now discussing a new set of procedures through which the county stations interact with each other and with the township veterinary stations, so that the county agencies help support the township stations as the "frontline" of service delivery in the county.

A process of learning

Our experiences of introducing PTD in Gongshan suggest that participatory technology development and extension approaches are a practical way to begin to addresses issues of performance, effectiveness and efficiency. Engaging in PTD in this context has been useful for:

- enhancing the skills of service providers including technical as well as other skills required for effective work in rural areas;
- inducing grassroots technicians to engage more frequently and more effectively in extension work in rural areas;
- reorienting county and township agencies' service delivery activities towards the needs of the farmers;
- promoting reform of organisational management structures and procedures; and
- enhancing collaboration between service agencies within the county.

Several factors were essential in bringing this learning about. The approach addresses the needs of villagers (options for improving production) as well as of technicians and officials (capacity building). Development of the approach has been based on practical work in which both technicians and CBIK have been involved, so a consensus has developed over what works and what does not. CBIK staff played key roles in facilitating technicians and officials to analyze issues and problems faced in terms of production problems in the villages, capacity building needs of staff and organisational issues. ■

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Better livestock management in Guatemala

Maricel Piniero, Danilo Pezo and Jorge Cruz

Cattle production in Central America is a source of stable income for livestock farmers. But in the eyes of environmentalists it is responsible for increasing deforestation. This contradictory picture emerged in the 1970s, when land allocated to agricultural production increased dramatically because of the increasing demand for meat, milk and other products. As a consequence of this huge demand, along with cattle production under unfavourable farm management conditions, serious environmental problems evolved. These included land degradation, and in particular, the degradation of pastures. In the region, more than 50 percent of pasture land is now degraded.

In 2003, the *Centro Agronómico Tropical de Investigación y Enseñanza* (CATIE) and organisations in three countries (Guatemala, Honduras and Nicaragua) began a project aiming to work with cattle farmers to find solutions to low productivity and environmental degradation. Partnerships were created between key stakeholders -farm families, local leaders and some crucial institutions- who have been involved in designing and testing alternative ecological, social, economic and political approaches for improved land use. By using a participatory approach, the project aimed to go beyond "local participation", because a livestock production system is much more complex than a crop production system.

The case of El Petén, Guatemala

The region of El Petén in Guatemala is known not only for its tourist attractions -the Mayan cultural sites- but also because it is a very important agricultural region. Located in the north of the country, the population of this region has been expanding rapidly for some time now, due to a high natural population growth and increasing numbers of migrants coming in from other areas of the country. This region started to become an important production area in the late 1960s, when the national government promoted colonization to reduce the social conflicts in areas with less potential. More and more immigrants became involved in crop and animal production, using forest lands, and currently, more than 50 percent of the agricultural land is used for cattle production.

Most farmers in this region have long-standing experience in cattle production, but because of changing environmental and social conditions, some of the practices used are no longer appropriate. Farmers used to practice slash-and-burn methods of farming, but due to the population increase, such extensive production practices are no longer viable, fallow periods have been reduced, and more forest area is being cleared for agricultural purposes as well.

In 2003, the project team identified local partners in El Petén who were affected by these ecological and production problems and who were interested in participating in the project. After initial visits to the pilot area, the team identified two farmer groups: PETENLAC, a farmer cooperative founded in the early 1990s, and an informal farmer group, that we referred to as *Ejido*. The members of PETENLAC own their land while members of the *Ejido* group are farmers who rent land from the municipal government. The cooperative used to process milk into products such as cheese and cream, but now only functions as a milk collection centre. For the project, we regarded members of PETENLAC as medium-scale and those from the *Ejido* group as small-scale livestock producers. PETENLAC farmers have, on average, about 84 hectares of land and own between 14 to 340 animals; the average land area allocated to animal production in three *Ejido* communities, El Zapote, La Sardina and La Pita, is 33 hectares, while animal ownership ranges from 7 to 98 animals. It was important to work with two different groups in order to be able to observe possible differences in group dynamics for participatory learning and experimentation. Aside from that, the focus of the project was on rehabilitation of degraded pastureland, hence working with farmers who own larger farms would give the project more chance to assess any impacts on the natural surroundings.

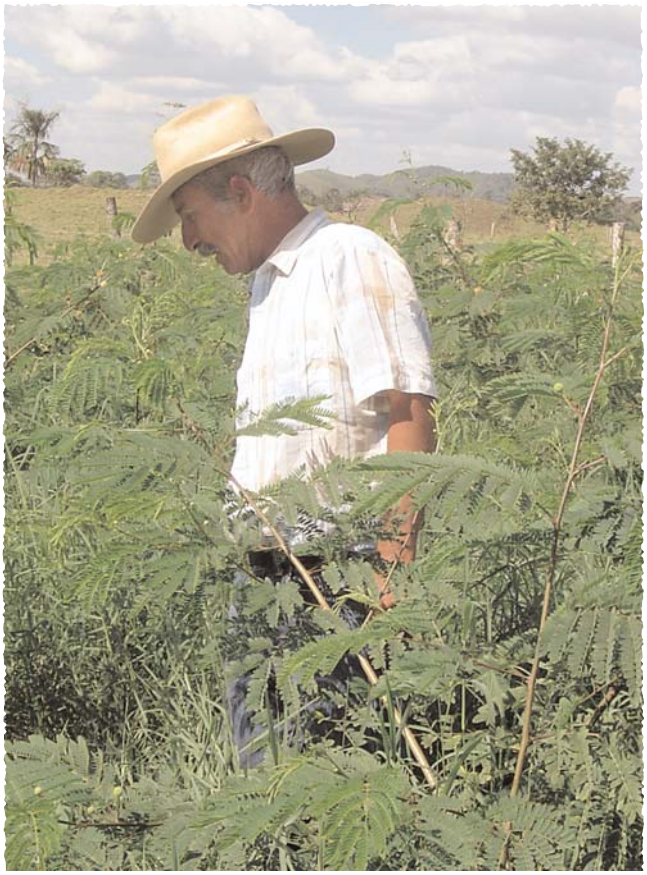

Photo: M. Piniero

Don Alvaro, who started the on-farm trials with a Leucaena fodder bank, monitoring his experimental plot.

The members of PETENLAC and the *Ejido* group who finally participated in project activities were the result of a "natural" selection process. First, all members of the different communities were invited to a presentation of the project, where it was emphasised that the focus would be on research and training, requiring active participation by the farmers. The intentions of the project were explained in more detail during a follow-up meeting, when only those who were really interested attended. This was followed by a series of discussions and meetings where farmers were involved in diagnostic activities, including a problem identification exercise related to their farms.

Our approach

A participatory approach to learning and capacity building is the heart of this project. This entails programming a number of events and activities in accordance with farmers' needs, their interest to learn from technical people and other farmers, and their willingness to share knowledge. Although the project's aim is to look for alternative land use options in degraded pasture areas, it did not start by introducing solutions and/or possible technologies that could alleviate the existing problems. Instead, it began with a prioritisation exercise of problems related to livestock production system. Using a "problem tree" analysis, farmers examined their own situation and identified factors causing the problem, as well as their short and long term impacts. In doing this, participating farmers got a broader perspective of the problems experienced, which helped in the identification of various research activities that could be implemented in farmers' fields.

After the identification and prioritisation of problems faced by farmers, different activities were implemented by the project in collaboration with farmers. The Farmer Field School (FFS) approach was used; this implies that farmers do not simply listen to lecturers, but they are encouraged to experiment, discover and try to understand the different aspects of a problem through practical work and good observation. For example, the presence of spittle bugs (*Prosapia* and *Aeneolamia* species), a common pest found in pastures, was identified by farmers as a major difficulty. This was the first problem that the project focused on. Through a number of trainings, farmers learned about the pest's life cycle, and about ways of controlling it. They made observations in their farms and learned how to monitor the pest population and then how to control it using a fungus, *Metarhizium*, as a biological agent. After all these activities, another meeting was held with the farmers, and possible causes of the problems with spittle bugs were discussed. One cause identified by the farmers was lack of knowledge about other types of fodder plants that could be grown on farms and that were less susceptible to spittle bugs. As a result training activities related to pasture adaptation to different constraints were also carried out by the project.

Unlike conventional on-farm trials, where farmers' role is often restricted to providing farmland for experimentation, FFS promotes full participation of all actors in implementing the activities. This means that farmers and technicians are involved in designing the experiments. Based on their rich local knowledge and experiences, farmers identified the types of technologies to be tested, and the plot size to be used for the experiments. Certain technologies were suggested to farmers by the project team, but the farmers were not always interested in experimenting with those ideas. In such cases, the project would establish a demonstration plot with the consent of one or more farmers. This was the case with a leucaena fodder bank which was tried by one farmer. Only after this technology was proved successful, did other farmers become interested in testing it on their farms as well.

Participatory processes

The farms became "learning places" where farmers, along with researchers and field technicians, discover and learn how technologies work in the area. Again, not all farmers participating in the project are directly involved in on-farm trials. Only those who volunteered, and that we referred to as "experimenters" or "innovators", were the ones testing some technologies on their farms. However, all farmers who are taking part in the project are involved in the evaluation of the experiments. This is particularly important since this approach allows for the incorporation of local knowledge in the interpretation of experimental results. For example, in the evaluation of the different improved pastures, the criteria used were determined by local farmers. These evaluation criteria were decided upon after asking the farmers, through focused group discussion, how they select pasture for their animals. Through these criteria set by farmers, participating farmers could easily relate to the experiments, and the feeling of ownership of the experiment was increased. Using farmers "language" or terminology, and including local knowledge, combined with technicians knowledge, played an important part in the projects' success.

The learning process included regular visits to other on-farm trials where farmers could share their experiences and the problems encountered during the experiment. Each farmer-experimenter can compare his plot with that of other farmers and appraise his own performance. In one such case, a farmer-experimenter considered his experiments to be "failing", after observing the "progress" made by a colleague. He decided to do his own trial again, taking into consideration what he had observed on the other farm, as well as what other farmers had mentioned as key elements for success, i.e., timing of planting and weeding practices. Finally, this farmer managed to conclude a successful experiment and he was pleased with the results.

Another interesting aspect of the participatory approach to experimentation in this project was that many participating farmers involved some of their children in the activities. Most of the local farmers are illiterate, and they were often accompanied in workshops and meetings by one of their older children. Such a son or daughter would then take notes for their parents, and can read and fill the evaluation forms during monitoring activities in the field. A lot of discussion between the parent and the child occurs during such type of activities, and this facilitates the transfer of knowledge between the older and the younger generation.

Important questions

While the implementation of this project has been successful, there are still some critical questions related to collaborating with farmers on the rehabilitation of degraded pasture land. For example, are we helping farmers to improve their pastures in a sustainable way with the methodology that we are using? Are we increasing their knowledge to allow them to make better decisions for their farms? Are we using an appropriate approach for sharing lessons learned among our local partners? And can we also influence policy makers based on the current project approach? Although further analysis is necessary, we believe we have made a good start and are on the right track.

The methodology that we are using is not new, nor is an end in itself. Instead of offering farmers solutions to problems they face, we persuade them to present their ideas on how these problems could be resolved. We encourage them to be innovative in finding alternative practices that could be tried in their fields. We do not provide them with recipes, but, where relevant, we suggest some technologies that could also be of interest in confronting their problems. In the end, it is the farmer who makes the final decisions. ■

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Documenting, validating and scaling-up local innovations

Florent Okry and Paul Van Mele

In marginal agro-ecosystems, farmers continuously look for technologies that best fit their bio-physical, economic and socio-cultural conditions. Formal research and development efforts still too often result in technologies requiring inputs that are not locally available. This is particularly the case for Africa. Out of necessity, and based on their cultural background, inherited knowledge and daily observations, farmers have generated solutions (even though sometimes partially) to their own problems. Unfortunately, these innovation processes, their results and potential for scaling-up are poorly studied and documented.

Photo: F. Okry

Rose, a project staff member, gathers information about local innovations.

To highlight the value of this rich resource and to develop mechanisms for local innovations to find their way into the formal research and development system, the Participatory Adaptation and Diffusion of Technologies for Rice-Based Systems project initiated several activities to encourage their national partners to document, validate and disseminate local knowledge and innovations. This IFAD-funded project is coordinated by the Africa Rice Center (WARDA). The first phase of the project was implemented from 2000 to 2003 in Ghana, Guinea, The Gambia and Côte d'Ivoire. An external evaluation of phase one emphasised that more attention had to be paid to local innovations. Incorporating this, the second phase began in 2005. Due to political instability, Côte d'Ivoire was replaced by Mali. With a shifting focus from rice to inland valley development, the second phase aims "to contribute to an increase of rice productivity, crop diversification and rural income generation through development, testing, evaluation and adaptation of appropriate innovations".

Capacity building for local innovation documentation

To strengthen the capacity of the Africa Rice Center's partners in identifying, documenting, validating and disseminating local innovations, three day workshops were held in each of the participating countries. Apart from national researchers, interested people from NGOs, the private sector, national extension services and related projects took part. Based on hand-outs and group discussions, each country team developed an outline for documenting local innovations. For example, the Guinea team came up with the following:

- Brief description of the context (problem(s) encountered, related knowledge and innovations available in the region);
- Origin of the knowledge he/she applied to solve the problem or observations he/she has made in the environment that gave rise to the innovation;
- Description of the innovation (process, materials and resources required); and
- Pre-validation of the innovation by farmer and his/her attempt to disseminate (success stories).

The outlines were slightly different from one country to another and only served as guidelines. However, as the project management considered the last point crucial in order to further prioritise local innovations, they made it a requirement for all countries.

Validation of local innovations

In April 2006, project partners from the four participating countries came together to review the first year of the second phase of the project. They took this opportunity to evaluate the documents submitted, looking at their potential for scaling up. In time for the workshop, Mali had submitted five local innovations, The Gambia six, Ghana seven and Guinea eight. The validation went through two processes: a short-listing and a ranking.

For linguistic reasons participants from Ghana and The Gambia formed one group, while Guinea and Mali formed a second one. The first group comprised five researchers, one extensionist and one development worker. The second group consisted of six people, including two researchers and four development workers, from either NGOs or development projects. The key objective of the short-listing was to filter out innovations that were not suitable for scaling-up, based on following criteria:

- Impact of the innovation on the environment and human health: innovations that might be harmful to the environment or human health were strongly discouraged;
- Local and regional availability of required resources; and
- Regional scale of the problem addressed and relevance of the innovation in other agro-ecosystems and socio-cultural contexts.

This screening process led to the elimination of almost half of the innovations submitted. Some interesting learning points came from the short-listing exercise, for example, in finding local solutions to overcome their difficulties, farmers may not consider environmental and human health. Processes to enhance local innovations should therefore facilitate farmers to develop sustainable solutions with care for the environment and human safety. Additionally, setting criteria for the screening process is context-specific. In fact, the importance of the third criterion "Regional scale of the problem addressed and relevance of the innovation in other agro-ecosystems and socio-cultural contexts" should be considered through the lens of the regional focus of this project and the objective of scaling-up.

Ranking of local innovations

Within each group, all members gave scores to the retained innovations, which were then ranked. The retained narratives from each group were translated overnight and the process was repeated the next day: Group 1 now scoring innovations of Group 2 and vice versa. The output of the entire validation process is as in Table 1.

Table 1: Results of the validation process

Innovations	Origin	Rank by Group 1	Rank by Group 2
Seed storage with Hyptis spicigera	Mali	1	1
Fight against wild rice by burning rice straw	Mali	2	1
Use of bamboo sticks or maize stalks to control termites	Guinea	3	4
Fight against termites using salt	Mali	6	3
Métè (Phyllantus discoides)powder to boost groundnut production	Guinea	3	6
Fighting red ants with black ants	Guinea	5	5
Control of iron toxicity using palm flower, lime and rice husk	Gambia	1	4
Seed storage and preservation by keeping panicles upright	Gambia	3	1
Use of lime, millet husk and mango leaves to control soil salinity	Gambia	2	6
Pounded neem tree leaves and ash to control termites	Ghana	5	2
Improving soil fertility using groundnut shells	Gambia	6	3
Using the hand as moisture meter	Ghana	4	5
Use of plain water to control termites	Ghana	8	7
Use of fire to control termite	Ghana	7	8

Group 1: Ghana and The Gambia; Group 2: Mali and Guinea

The composition of the groups undoubtedly influenced the scoring and ranking process, as illustrated by the case: "Control of iron toxicity using palm flower, lime and rice husk". Iron toxicity is one of the major problems for rice cultivation in West and Central African lowlands. Hence, formal research is on-going, with a major emphasis on breeding for tolerance.

Surprisingly, this local innovation was ranked highest by the Ghana-Gambia team, while it did not even rank among the top three innovations in the other group. In fact, this local innovation was tested on-station by a scientist from the National Agricultural Research Institute, The Gambia. His results, presented during the first day of the workshop, confirmed the positive effect of the innovation. This certainly impressed the other scientists and was the main reason why the group of Ghana-Gambia, nearly three-quarters of which were researchers, ranked it highest. The Mali-Guinea group, two-thirds of which were development workers, considered instead the popularity of the innovation within the community of origin and the cost of materials required. It was only at this stage that the participants realised that only a few farmers knew about the innovation. Probing for more clarifications, the innovator appeared to be the chairman of the National Farmers' Platform, who is known as a politician and is fully engaged in off-farm activities. Being a well-off farmer, he could easily afford to buy the expensive lime. We concluded that the scaling-up potential of this innovation remains to be proven before it can be considered for dissemination to resource-poor farmers. At this stage, the innovation was rejected for scaling-up despite the fact that it deals with a serious problem of rice cultivation. Before validating this innovation on-station it would have been better to assess why other farmers in the community are not taking up this idea.

An important learning point from this exercise was that the background and the perception of people involved in the validation process significantly influences their judgment: similarly, the innovation "Use of lime, millet husk and mango leaves to control soil salinity" was classified by Group 1 as the second most important innovation, while Group 2 considered it as one of the least important ones. Again, Group 1 appeared to have been influenced by the extent of the problem addressed, rather than the innovation itself and its chance of adoption by others.

As such, only a well-balanced group and a carefully facilitated session will lead to a good prioritisation. Facilitators aiming to disseminate local innovations to resource-poor farmers should also analyse the profile of the innovator. This indicates the level of resources and knowledge required for its adoption. It is also important that when documenting local innovations, one should also describe the extent of actual diffusion. This indicates the level of replicability and scaling-up potential.

Scaling up strategies

So far, project teams in Mali and The Gambia have disseminated local innovations through video, rural radio, poems and songs. Fruitful experiences will be extended to other countries during the second year of implementation. Publications such as pamphlets and journal articles will also be used to complete the documentation process. To encourage partners to document local innovations on rice, project management initiated a local Innovation Documentation & Enhancement Award (local IDEA) in November 2005. The competition is open to anyone from project countries until November 2006. (For more details about this competition, please contact Paul Van Mele at p.vanmele@cgiar.org)

Influencing the research agenda

Some of the local innovations listed above have been incorporated into the formal research agenda. The use of *Hyptis spicigera* to control termites and other seed storage pests is currently being tested by an entomologist at the Institut d'Economie Rurale (IER) in Mali. Scientists from the Africa Rice Center in Benin have incorporated "The use of maize stalks to control termites in the field" as one of their experimental treatments.

Giving recognition and value to local innovations is crucial to institutionalise them in the formal research and development system, in order to contribute to community empowerment and rural development. To achieve this, a validation or screening process is an important intermediary step. At this stage of the Participatory Adaptation and Diffusion of Technologies for Rice-Based Systems project, we cannot pin down best-bet methodological steps. However, we have learnt that the validation process is context-specific, based on project objectives and largely influenced by the participants' background and perceptions. A broad stakeholder representation and good facilitation will add to the quality of the process and will avoid any inappropriate local innovations being scaled up. ■

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From piloting to scaling up

Dindo Campilan, T.L. Lama, S.R. Ghimire and Oscar Hidalgo

Potato plays an important role in the livelihood and food security of farming communities in Nepal. As the fourth most important food crop in the country, potato cultivation extends from the southern plains to the remote northern mountains. Yet Nepal has one of the lowest national yield averages globally and for the developing world. Diseases are a major limiting factor in improving potato productivity in the country. Use of low-quality seed, and poor crop management practices are among the key factors contributing to the widespread occurrence of disease. In addition, potato farmers are rarely reached by formal research and extension services. Government agencies are constrained by limited resources and capacities to respond to problems faced by potato farmers in far-flung areas.

Participatory research and development often begins with a pilot activity that involves a small number of participants within a limited geographic area. No matter how successful, these pilot activities inevitably face the challenges associated with scaling up successful experiences beyond the pioneering farmer groups and farming communities.

Piloting Action Research

From the late 1980s to early 1990s, a local research institute conducted several diagnostic activities to assess serious crop losses faced by potato farmers in Kaski district. Researchers from the Lumle Agricultural Research Centre (LARC) and local farmers jointly identified bacterial wilt disease as the single most important problem facing potato farmers: losses in yield were documented as being from 10 percent to over 90 percent. Its occurrence was mainly associated with the use of infected seed, along with planting in infested soil and poor crop management practices.

Introducing a socio-technical innovation (1993-98)

Since the early 1990s, the International Potato Center (CIP), through the Users' Perspectives With Agricultural Research and Development (UPWARD) programme, has worked with various public and private sector organisations in Nepal to help potato farming communities address disease constraints. In 1993, UPWARD and the Lumle Agricultural Research Centre initiated a research project to help local potato farmers manage bacterial wilt. Drawing on previous research, including control measures for bacterial wilt based around seed and soil health, the project team formulated an Integrated Disease Management strategy with the technology components as presented in Table 1.

Table 1. Technical and social components of the Integrated Disease Management strategy for bacterial wilt

Key technical components
- Elimination of infected planting materials
- Three-year moratorium on potato cultivation
- Use of clean seed and quarantine scheme
- Rouging and field sanitation
Key social components
- Reaching community consensus on IDM implementation
- Formation of a village level committee to oversee IDM implementation
- Enforcement of community-agreed incentives and sanctions
- Regular monitoring of IDM implementation by community members

However, in implementing this strategy, it became clear to the project team that the proposed technical solutions were not adequate to manage the disease problem. There were crucial socio-cultural and economic factors that hindered implementation of the technology components. For example, enforcing measures to control the spread of infected seed implied restricting the use of seed potato as a cultural symbol in traditional rituals (e.g. as wedding gifts). Most importantly, carrying out the entire Integrated Disease Management strategy required full community participation, since if only one farmer refused to stop planting potato this would create conditions for the pathogen to persist in the soil and spread in the community.

During a series of community meetings and with the guidance of the project team, local farmers identified the social measures needed to accompany the technical components of Integrated Disease Management (Table 1). To oversee its implementation, a village-level committee was formed to promote incentives for participation (e.g. introducing alternative food crops during the three-year ban) and to enforce sanctions for non-compliance with the jointly agreed strategy (e.g. imposing fines on farmers found to have planted potato during the three-year ban).

Impact evaluation

Project implementation was sustained in one village for a three-year period. All of the 51 farming households fully complied with the technical and social requirements of the strategy. In contrast, implementation of the same strategy came to an early end in the second village after the committee disbanded within a year of launching the project. Among the key reasons were: farmers' perceptions about the committee's lack of formal authority to assume "police" powers; the resignation of key committee members due to emerging conflicts with farmers in the latter's performance of their assigned tasks; and the inability of individual farmers to cope with pressures to meet immediate food and livelihood needs of their own households.

The contrasting experiences unwittingly provided an opportunity to compare outcomes between the two communities. Post-project evaluation carried out after three-year implementation period revealed that in the first village, bacterial wilt was completely eliminated. In comparison, a disease incidence of 75 percent was observed in the second village.

Scaling up the innovation (1999-2005)

Following positive outcomes of the community-mobilisation approach, a follow-up project was launched in 1998 that aimed to implement integrated disease management in other key potato-growing areas across Nepal. CIP-UPWARD teamed up with the Department of Agriculture through its Potato Development Section. In planning to scale up the innovation for community management of bacterial wilt disease, the project team recognised that the innovation cannot exclusively focus on bacterial wilt because farmers in potato-growing areas face several disease constraints at any one time. In many cases, bacterial wilt is part of a broader set of problems that includes diseases, seed supply and quality, and general crop management, which need to be taken into account. In addition, to reach more farmers more quickly, a more extensive approach needs to be employed for facilitating group learning to help farmers manage location-specific constraints to growing a healthy potato crop.

The Integrated Disease Management innovation subsequently evolved into Integrated Crop Management of potato through

participatory group training, based on the farmer field school (FFS) approach.

Institutionalisation

While the lack of any previous experience in potato FFS was a major bottleneck, the project benefited from an earlier programme in Nepal which focused on integrated pest management in rice. The approach for rice was adapted to suit the potato crop and the constraints being addressed. For example, rather than weekly training sessions, the schedule was adjusted to fit with the growth stages of the potato crop. Because there was a wide variability in potato systems and constraints among FFS sites, each group of facilitators and farmers developed their own locally-relevant training curriculum. Thus, although they had a common focus on seed health and late blight, each FFS decided to include bacterial wilt, true potato seed, and/or crop management. From 1999 to 2003, 1320 farmers in 14 districts across the country participated in FFSs on potato Integrated Crop Management.

Photo: Dindo Campilan

Farmers monitoring the progress of field experiments with potatoes in Nepal.

At the national level, the project realised that sustaining these FFS activities would require longer-term funding commitment from the government. Extension workers were keen to implement FFS, but needed funding support to travel to remote potato farming communities and to secure clean seed and training materials. On the other hand, government funds can only be accessed if there is an officially approved allocation for potato FFS from the annual budget for agricultural extension.

Thus the project published and distributed training manuals for use by local extension workers, in partnership with CARE Nepal. These materials were crucial for FFS facilitators in remote villages with limited access to information sources. The project team also joined an informal advocacy network that sought to mainstream the FFS approach in Nepal's agricultural extension policy. Consequently, the national government officially adopted the FFS approach as part of the agricultural extension strategy, under Nepal's national development plan for 2003-2007.

This policy support paved the way for district-level agricultural extension offices to access government funds for implementing FFS activities. Similarly, NGOs have adopted the FFS approach to extend their outreach programmes, having found this to be consistent with the principles of community empowerment and locally-driven development that they promote. Between 2003 and 2005, 130 FFS activities on potato Integrated Crop Management were implemented and funded by various organisations in Nepal. By 2005, over 4000 farmers had already taken part.

Lessons from the experience

An initial impact evaluation was conducted in 2002 to assess changes in farmers' knowledge and practice. Over 80 percent of FFS participants correctly answered a knowledge test on the judicious use of chemicals, and adopted the practice of using healthy seed. The evaluation also revealed wide diffusion of innovation, where an FFS participant shared information with an average of 18 other farmers. A follow-up impact evaluation in 2005 assessed longer-term outcomes, particularly the socio-economic benefits of the FFS to farming households. Similarly, findings indicated that maintenance and use of clean seed was the most common Integrated Crop Management practice adopted by farmers two years after the FFS. Economic analysis showed that gross and net returns to land and labour significantly increased post-training as compared to before the training.

However, the evaluation revealed that producing adequate supplies of clean seed remained a continuing challenge for farmers. Thus in 2006, the FFS approach was further adapted to focus production of clean seed through true potato seed technology, which makes use of botanical seeds rather than whole tubers. With funding from the Japanese government, local Nepal partners have since then conducted a national program to conduct FFS activities, this time with a curriculum centred on using true potato seed in on-farm seed production.

Agricultural innovations successfully introduced in pilot projects cannot be expected to have the same level of outcomes and degree of relevance when scaled up beyond the pioneering farmers and farming communities. Variability in needs, opportunities and conditions require that these innovations need continuous adaptation when introduced to other communities. Scaling up also requires a careful re-examining the means of dissemination and sharing. While the community mobilisation approach was shown to be effective in introducing an integrated socio-technical innovation, scaling up efforts required other learning mechanisms in order to reach more farmers. ■

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Change through shared learning

Mark Lundy

In 2000, the International Center for Tropical Agriculture (CIAT) began experimenting with new ways of linking research and development. This came out of a deep frustration with traditional training courses and research activities, where knowledge is normally transferred in one direction. Participants in training courses often adapt, change and improve what they learn as they make use of it in their day-to-day work, but this richness and creativity is rarely documented or understood. In a similar way, much research has been carried out in a way which extracts knowledge from local communities and provides little in the way of useful feedback. Through discussions with several NGO partners in Central America, we reached a conclusion that there had to be better ways to link research and development processes, and so embarked on the journey described here. Since that time, this approach has spread widely under the name of "Learning Alliances" and is currently in use with multiple partners in more than 30 countries.

What is a Learning Alliance?

We currently understand a Learning Alliance to be a process undertaken jointly by research organisations, donor and development agencies, policymakers and private businesses. It involves identifying, sharing and adapting good practices in research and development in specific contexts and on specific topics. We are not looking for one right answer, but rather for the combination and recombination of knowledge from many different actors as we work together to solve key problems. Results can then be used to strengthen capacities for development practice, generate and document development outcomes, identify future research needs and areas for collaboration, and inform public and private sector policy decisions. This approach constitutes a qualitatively different way for research and development actors to work together.

To date, a range of farmer organisations are participating in diverse Learning Alliances, but usually with the support of others –for example international NGOs– with whom they are collaborating. It is important to note that, over the last six years, the range of actors who participate in a Learning Alliance has grown substantially. A Learning Alliance seeks to identify leverage points through which system change can be achieved. This leads us to combine different types of participants in common learning processes to find innovative ways of promoting rural development. For example, the inclusion of policymakers from funding agencies or the private sector permits a wider perspective on processes of rural development. This wider dialogue, in turn, facilitates greater collective understanding and, potentially, change to make all of our work more effective. Under this approach no one group receives preferential treatment as all are perceived as valid participants in existing innovation systems.

What does a Learning Alliance seek to do?

The main objective is to facilitate the identification, adaptation and, finally, adoption of approaches, methods and tools that will improve the effectiveness of rural development processes. Diverse partners will require, and provide, different information and knowledge. For example, development agencies can provide concrete experiences where approaches or methods have or have not worked and explain the reasons to others. Research agencies, in turn, can help understand why certain approaches are effective in some communities and not in others. The combination of development experiences and research tools is a good starting point for establishing discussions with policymakers about what approaches are most effective to facilitate rural development processes that are both inclusive and effective in terms of poverty reduction. Finally, the lessons learned through common processes help to facilitate informed dialogue with larger scale private and public actors.

How do Learning Alliances work?

The establishment of a Learning Alliance begins with the identification of a general theme. In this case, the theme is rural enterprise development. The second step is to identify and convene organisations interested in learning about this topic. These organisations may be limited to a specific geographic area, or based on contacts and networks that already exist. At this stage it is important to select partners who have both the interest and capacity to participate in the entire process. A diversity of skills and experiences is an asset for this kind of learning process, as is the inclusion of "non-traditional" partners such as private-sector firms, government agencies and donors.

Once the initial group of organisations is identified, a workshop is held to identify specific learning questions or topics on which the learning process will focus. Under the topic of rural enterprise development, for example, Learning Alliances have looked at issues including identification of market opportunities, rural knowledge management, supply chain upgrading and governance and the effects of rural enterprise development on natural resource management. At this point, the most important thing is to identify topics around which sufficient interest and energy exists to move things forward. Another key issue is the definition of roles and responsibilities of the participating organisations. To assist in this, each topic is organised as a learning cycle.

In our experience, there are different levels of participation in each of the steps in the cycle. As a result, it is helpful to allow the participating organisations to define whether they wish to play a leading role, participate actively or have access to the results at each step. Another benefit of organising in this fashion is that organisations can use their strengths, i.e. they are not forced to participate in aspects of the learning cycle where they have little expertise, but remain active members in the overall process.

Once the roles and responsibilities have been identified, a simple work plan can be developed. The timeframe for implementing a learning cycle varies depending on the complexity of the specific topic and the time and resources needed to effectively test the prototype methods, tools and/or approaches in diverse contexts. In our experience, cycles can range anywhere from two to three months to up to one year.

At the conclusion of a learning cycle, several intermediate and final products are available to share with others. These include a document reviewing existing good practices; initial prototypes of methods, tools and approaches based on existing good practices; and improved or adapted versions of those prototypes tested in distinct contexts. Documented results achieved through the use of the prototypes in diverse contexts are also available, as are answers or at least as advances on the initial questions posed by the learning cycle. In addition to these products, the learning cycle also contributes to increased knowledge and skills among those participating.

Table 1. Types of learning documented in the Central America Learning Alliance

Type of learning	Description
Organisational learning practices	• Improved internal information flows between partner offices in Central America, mostly through informal channels • Processes of shared organisational learning among partner agencies lead to increased cooperation among them • Contribution to institutionalising organisational learning initiatives beyond the theme of rural enterprise development
Development interventions	• Increased focus on marketing and supply chains, not just on-farm agricultural production • More ordered development processes that incorporate elements of enterprise development • Focused complementary research provides new insights on rural enterprise development processes
Specific knowledge and capacity development	• Use and adaptation of a wide range of enterprise development tools in four countries by 19 partner agencies working with a total of 57 local organisations

What have we learned?

Our experience in using this approach in Latin America, Africa and Asia has shown that there are several general issues that are common across nearly all of the Learning Alliances in which CIAT is participating. These include:

- *Partner and participant selection.* The selection of partner agencies and appropriate individuals is critical to success. Both agencies and individual staff should be open to critical reflection and learning about their own practice. In addition, partner and participant turnover has significant negative impacts on the learning process and should be avoided if possible.
- *Process facilitation and coordination.* To stay vibrant, a Learning Alliance must adapt and change as learning occurs and new questions arise. CIAT recommends assigning staff to this area to ensure that goals are met and partners do not lose interest in the process. Contrary to development projects, where the biggest share of the budget is allocated to operations; Learning Alliances need to allocate a higher share of their budget to personnel.
- *Funding.* Finding a donor agency interested in funding an open-ended learning process is the exception rather than the rule. It may be easier to get funding for specific research and development projects that use a Learning Alliance as an implementation mechanism. Funding can also be found by linking to large development initiatives, replacing dissemination and training budgets with Learning Alliance activities. This issue should be discussed early during project design and often in the process to guarantee some sustainability.
- *Linking learning.* Documenting, analysing and sharing a wide range of learning from diverse partner agencies at all levels is demanding. The selection of a few key research questions that link partner agencies is one way of managing this, as are the creative application of diverse tools and methods to promote processes of reflection and learning (see, for example, *LEISA Magazine* Vol 22.1).

Results from the Central America Learning Alliance

What kind of learning is actually occurring within the alliances? Initial results in Central America highlight changes in organisational learning practices and development interventions as well as the acquisition or improvement of specific knowledge and capabilities. Table 1 presents a brief description of the kinds of learning encountered in Central America.

For participating partner agencies and their staff, the kind of learning occurring in the Central American Learning Alliance has several implications. First, participating staff are recognised within their organisations and by others as resource people for processes of enterprise development. Participants access knowledge and improve specific skills that improve their capacity to lead market-oriented processes of rural development. Secondly, participating organisations are able to generate innovative interventions based on increased staff capacity and knowledge as well as improved internal knowledge management and thus differentiate themselves in the development marketplace and compete more effectively for scare resources.

Discussion and conclusions

One of the main reasons for initiating the work on Learning Alliances was a realisation that a research centre can only play a small role in improving processes of rural development. By linking with other like-minded organisations in a meaningful fashion, the potential contribution of research to a larger innovation system can be important. As this work has advanced, we have identified some critical points through which effective change can be achieved. Often, these critical points involve working with "non-traditional" partners, such as large-scale private processors, national and international retail chains and governments at different levels. While partnerships of this nature are seldom easy to establish and maintain, we feel that they provide an important leverage point to improving the lives of smallholder producers in many parts of the developing world. Learning Alliances can provide a shared space in which to develop and nurture these initiatives while participating organisations adapt to these new partnerships.

The basic premises behind Learning Alliances are not entirely new, nor are the approaches used in terms of learning cycles novel. What makes the Learning Alliance approach different and useful is the fact that it brings together a diverse range of actors who, traditionally, have not worked together to solve problems. While this framework does not mean that all the difficult questions and issues related to relative power, decision-making and social equity can easily be resolved, it does provide a forum for these discussions. In addition, the development of shared knowledge relevant to all actors involved is an important step towards building a common understanding of what can and needs to be done to support the development of rural communities across the globe. We believe that the combination of personal and organisational change will lead to more effective processes for rural development by partner agencies. This point is currently being evaluated in Central America, with results expected by the end of 2006. ■

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In search of new sources of protein

Hans Peter Reinders

The use of natural resources near the city of Iquitos, in the Peruvian tropical Amazon basin, is far from sustainable. Due to the high demand from the city for products from the forest, as well as increases in population, life in the rural areas has become very difficult for the local people. The products which they used to extract for their own consumption, such as fish and bush meat, are scarce nowadays. This results in malnutrition, mainly due to the lack of protein in the daily menu. Aiming to improve the livelihoods of the inhabitants, the NGO *Asociación por la Amazonía* (APA) started an EU-funded project in the river Momón in 2004, promoting sustainable natural resource management.

Alternative sources of protein

After the first rural appraisal it became clear that the problem of malnutrition was enormous; an alternative source of protein had to be found. In the first year of intervention, the NGO opted to promote poultry production. Every family could receive a number of chickens, which were meant to serve as the main source of protein. The first results were promising, but a wide range of diseases soon killed the majority of the newly introduced birds. A second attempt at improving the daily diet was to start producing beans. Villagers in different communities responded positively to the idea of growing beans, but mentioned that it would be difficult because of insects such as leaf-cutting ants *(Atta cephalotes)* and grasshoppers (*Gryllus* spp.), which could seriously affect yields. To find a solution, villagers in the whole area where the NGO was working were invited to take part in experiments to find ways of controlling the large number of insect pests. In total, 10 families from three communities said they were interested to participate in a small Participatory Technology Development (PTD) type research.

All farmers were convinced of the urgency of improving their diet, and after their first experience with poultry production, they were open to look for new opportunities. Growing beans seemed the most logical option. As migrants from other zones in Peru, they said that they had grown beans before, but at that time, nobody was doing it - they all stated that it was impossible because of the insects. During a first meeting, villagers were asked to propose pest control techniques which they would like to try. The list of potential measures to try to control pests was enormous, ranging from manual methods (picking up all larvae) to the use of cooking oil and chemical pesticides (see Box). This showed that the farmers had done their own experiments with other crops.

After a long discussion, the group decided to try using a repellent made with spearmint (*Mentha spicata*, fam. Lamiaceae*)*, and also to try using an extract of the *barbasco* plant (*Lonchocarpus nicou*, fam. Fabaceae*)*, which is used locally to fish in the rivers.

Photo: Author

The experiments produced good yields, but not all farmers began growing beans.

Asociación por la Amazonía established contact with the local university, where several studies had been done on the use of repellents and plant species used for pest control. Their entomologist was willing to participate and provided the necessary technical details for the preparation of the spearmint and *barbasco* solutions. But it was not so easy to convince other staff of a full participatory approach: they all had a very traditional view on how to do research, and were only familiar with trials on experimental fields, where all conditions are perfectly controlled. Doing research under field conditions was a completely new approach for them, and the fact that the participating farmers would apply their own repellents in their own experimental plots was a step too far. Their reasoning was not new: the analysis has to be statistically sound and they have to be able to publish the results, for which all trials and applications have to be similar. Coming to an agreement, the team decided to include two students in the trials. They could spray all fields and help with the preparation of the solutions, thus guaranteeing some continuity and similarity throughout the whole experiment. This was to serve as an assignment for their thesis, which would count towards the students obtaining their B.Sc. degree in agronomy.

Trying things out

Each of the ten participating families made a small plot of 20 by 20 meters available, where two different varieties of beans

Some of the possibilities for controlling pests mentioned by the Momón farmers

Manual methods: Pick up the larvae of the ants by hand. Capture the leaders of a row of ants.
Repellents: An extract of the yuguilla fish, smoked eel, strong fermented cassava beer, cooking oil, a mixture of salt and pepper, old motor oil, old batteries, human discharge, fishbone of the carachama fish, yeast, kerosene, an extract of the barbasco plant, an extract of spearmint, blood of a woman.
Chemicals: Lorsban (chlorpyriphos), Sevín (carbaryl), Aldrín (aldrin), Tamarón (metamidophos)
Others: Greet the ants every morning and ask them to leave the crops, make a fence around the crops, fill up the nests with petrol and blow them up.

were sown. The plot was divided into three different parts: one part was treated with *barbasco,* the other was treated with a spearmint solution, and the last was left as a control and not treated. The NGO provided a knapsack sprayer and the farmers gathered the necessary plants, which were then prepared according to the indications given by the university people. After several months the plots started producing and the results were generally good. But recording of various measurements did not go well: the students left before the harvest, as they could not stand the conditions in the village, and returned to the city. Some of the participating families harvested the beans and ate them before measuring the total production. Not surprisingly, the university did not find any significant difference between the treatments and the control in their statistical analysis.

In spite of these difficulties, results were clear to all participants. In an evaluation workshop, the participants indicated that the impact of *barbasco* was evident, while the repellent effect of spearmint was limited. It also became clear that the location of the plot is important: beans in plots where the primary forests were cut for the first time had less damage by the leaf-cutting ants than those grown in secondary forests. And one of the bean varieties gave much better results than the other. At the end of the process, all participants were convinced that growing beans is a possibility in their area, and that doing so could improve their daily meal.

Overall results

Two years later, however, only some of the participants of this experiment are still growing beans. All of them have quite good yields, without using *barbasco* or any other product for controlling insects. However, no other farmers, either in these or other villages, are currently growing beans, so local bean consumption is limited. The result of the process may seem diappointing, but in fact the bean trials led to many positive results:

- Convinced of the usefulness of a participatory approach, the same NGO continued with its project and started promoting the construction and use of local fish ponds, with the same objective of improving protein consumption. Ponds were built using local materials, and then filled with young fish of local species. Special emphasis was put on local knowledge and on the participation of all villagers. Results have been positive, as fish caught in the rivers grow well in the ponds, they are not prone to diseases, and taste much better than beans.
- Those who participated in the experiment and grew beans became very active in the promotion of the fish ponds, recognising the need to add protein to their daily diets and the possibilities of doing so using their own resources and abilities. Awareness of these possibilities came alongside increased self-confidence and recognition of the benefits of working together.
- Despite her students, the university entomologist became convinced of the possibilities of working together with farmers and the rural population, realising how her profession could contribute to poverty alleviation and rural development. She developed a special interest in the exchange of information with farmers, surprised at the fact that the exchange of information and the development of new knowledge could easily take place during the same exercise. Her continuous participation showed that academic professionals can be convinced of a participatory approach if they see that the knowledge which results from such an approach is directly applied by farmers (in contrast to what commonly happens with their work).

This experience showed that it is possible to develop and try out new technologies by doing participative research. If local knowledge is seriously taken into account, and if research is oriented at a problem that the people themselves define, then this population will most probably be very willing to participate in the experiments. The outcome, however, may differ entirely from what is expected at the beginning.

PTD experiments are a "real-life" attempt at trying something out, and not just an appraisal or an identification of problems. As such, constraints commonly found in the field, such as time limitations, lack of resources, or difficulties with the local agricultural calendar, will have a large impact on the way the whole exercise works out. At the same time, a participatory process implies including different actors with different expectations and interests, all of which need to be considered. In this case, for example, we had students who wanted to obtain a B.Sc. degree, an NGO interested in completing its project, farmers who wanted to maintain a good relationship with the NGO, and researchers who wanted to publish their results. The effect that all these different expectations will have on the process is hard to predict.

Furthermore, the work of APA showed that a "real-life" experience is necessary to find out and analyse the technical and also the cultural considerations related to the improvement of a production system. All participating farmers were convinced of the difficulties posed by insects. But just as important were the local eating habits, and the fact that farmers and villagers in general were not used to eating beans. This cultural aspect became clear after the trials and the introduction of the fish ponds, but not before. The work of *Asociación por la Amazonía* also showed that when something does not go as expected, this provides a great opportunity for trying out new activities, and for learning things we could not have predicted or imagined. The introduction of fish culture corresponds much better with the local eating habits, and, because of their positive experience with the bean trials, most of the bean growers became very active in the promotion of the ponds. The overall result is an improved diet. ■

Photo: Author

Participating farmers visit each other's experimental field and discuss the results of their trials.

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Improving pig feeding systems in Vietnam

Dai Peters, Mai Thach Hoanh, Nguyen The Yen, Nguyen Thi Tinh and Pham Ngoc Thach

Raising pigs is a common income-generating activity in Vietnam. Many farmers in the north of the country use fresh sweet potato as the main pig feed. This makes good use of a crop which does not sell so well, and the pigs provide manure for the farm. This integrated system is very important to rural household economies, and it was widely acknowledged that improvements in the system could have extensive impact.

Scientists from the International Potato Center (CIP), together with Vietnamese collaborators from various institutions and disciplines, began working together in 1997 to improve these sweet potato based pig-feeding systems in northern and central Vietnam. Three main improvements were tried through the Participatory Technology Development approach: selecting sweet potato varieties which were most suited for pig feed; processing sweet potato roots and vines to improve nutritional value; and improved pig-feeding methods and management to enhance growth efficiency. An overview of project activities is provided in Table 1.

Assessing the current situation

A situation analysis was carried out between 1997 and 1999. This included a survey of pig production techniques, which was conducted through exploratory studies and observations in a few towns; a series of formal studies using a survey, based on the results from the preliminary studies; and continuous reconfirmation and verification of the survey results in the field with informal discussions with farmers.

The results of this situation analysis showed that the scale of pig production, as well as feeding methods, was more commercial in the south than in the north. Small farmers in the north use fresh sweet potato roots and vines, dry cassava chips, rice, rice bran, maize, and various forms of vegetables/grasses as the main sources of pig feed. Such feeds are not commonly used in southern Vietnam. There, pigs are mainly produced on a large-scale and fed on commercial feed. Based on this data, the project team focused its efforts on improvements for small pig producers in the northern and north-central provinces of Vietnam.

Participatory Technology Development (PTD)

Various PTD activities were carried out during the six years of the project, including technical options described here: selecting sweet potato varieties specifically for pig feed; sweet potato processing for use as pig feed; and pig-feeding trials to examine the methods of increasing pig growth efficiency. As the project evolved, the use of other important feed sources such as cassava and peanut stems was also included as new research activities.

All trials with farmers were done in the Red River Delta area, near Hanoi. Farmers here generally have only 2 to 4 pigs per production cycle, and only two cycles a year. They practice intensive crop rotation all year round with some irrigation from the Red River or other smaller rivers. The crops commonly grown here are rice, sweet potato, cassava, and many vegetables. Chemical fertilizer, animal manure or compost are applied to the crops as the production system is quite intensive and there is very little opportunity for fallowing the land. Relatively inexpensive chemical fertilizers are available in the market from China, and the farmers make compost by mixing pig manure and crop residues. The combination of such fertilizers with access to irrigation makes it possible to carry on with such an intensive production system.

Trial farmers were selected based on their willingness to participate and on other criteria such as having the amount of piglets needed for the trial, meeting some minimum requirements for the pig pens (to minimise environmental variation), and their ability to follow simple instructions on weighing and recording feed rations. A farmer who participated in all the trials throughout the years was selected for daily follow-up and advising newly participating farmers. Different participants were selected each time a new trial began, in order to give as many farmers as possible an opportunity to learn from participating in the trials. This also meant that as many farmers as possible were exposed to the new ideas. Participating farmers were always offered an informal training on the different treatments, the fermentation process, methods of mixing the various feedstuffs, and on how to weigh and record the feed given to the pigs.

Selection of varieties

On-farm sweet potato varietal selection trials were conducted in various locations and during different seasons. Two types of varieties were used in the trials: dual-purpose varieties, where both vines/leaves and roots are used as pig feed, and forage varieties, where vines/leaves are complemented by cassava roots or maize in the diet. Dual-purpose varieties are planted after a rice crop in paddy fields of northern and central Vietnam as a winter-spring crop, as this is the best season for root production. In 1999, after three years of selection, a couple of sweet potato clones emerged as high-yielding and with wide adaptability. They were released through the formal government channels as sweet potato varieties. More clones are being developed, but in the meantime many farmers have adopted the new varieties and are satisfied with them. Although there is also potential for

Table 1. Project activities conducted between 1997 and 2002

Process	Activities	1997	1998	1999	2000	2001	2002
Situation analysis	Pig production assessment	●	●	●			
	Supply-market chain identification			●			
Participatory Technology Development	Sweet potato varietal selection	●	●	●	●	●	●
	Sweet potato root and vine processing		●	●	●	●	●
	Pig feeding trials with silage		●	●	●	●	●
	Sweet potato and cassava combination feeding				●	●	●
	Sweet potato and peanuts fermentation						●
Scaling up	Farmer-to-farmer training						●
Monitoring and evaluation	Impact study						●

Photo: Dai Peters

The farmer-trainer demonstrates how to use a hand cutter to shred sweet potato vines.

improving the total protein content in sweet potato vines, selection for this purpose was of less interest to the farmers.

Processing for use as feed

Farmers face three constraints after harvesting sweet potatoes: storage, high labour demand for daily processing of sweet potato roots and/or vines, and the need to cook the sweet potato roots before feeding them to the pigs. Without adequate storage facilities, farmers are often forced to feed large quantities of sweet potato to their pigs immediately after the harvest. The fresh roots contain high levels of a trypsin inhibitor, a substance which makes it difficult for the pigs to digest and get enough protein, unless it is cooked first. They are therefore unable to get the most benefit from the feed, and cannot grow so well.

Trials were conducted by farmers to find simple and low-input methods of turning feed into silage (known as ensiling) to conserve roots and vines. If this could be done, farmers could process what they harvest and then use the resulting silage during the busy field season or when other feeds are scarce. In ensiling trials, farmers experimented with a wide range of fermentation methods to increase the nutritional value, extend the storage life, and reduce the labour requirement for daily processing of pig feed. Twelve different ways of ensiling sweet potato vines with various proportions of different additives were tested. The vine trial was later replicated for root silage. The results of these trials showed that ensiled roots and vines can be stored for up to five months, and there was no significant difference in nutritional value of the feeds between 14, 30, 60, and 90 days after silage. Ensiling is a simple process that requires little investment. The only equipment needed is a set of scales for weighing the ingredients, and bags for storing the silage. Thus, farmers can easily adopt this silage method to improve pig growth and increase profit. Most importantly, the silage process eliminates the need to cook the feed, as it breaks down the substance which made the feed difficult to digest. This saves two to three hours of labour per day, as well as the fuel necessary for cooking the pig feed.

Pig feeding trials

Feeding trials were conducted following the silage trials, to examine the effects of feeding root or vine silage to pigs. The most important finding was that uncooked sweet potato root silage was as good for pig growth as cooked sweet potato roots, though with much lower costs in labour time and fuel. Farmers who only kept between two and four pigs at a time when the project activities started, are now raising more than 20 pigs at a time. Cooking the feed was a major limitation to increasing the herd size, and without this constraint they now keep many more pigs for fattening as well as sows to produce their own piglets.

When the idea of using fermented feed was introduced, and it was not known what effect this feed could have on the pigs, the project paid all costs in order to minimise the risk for participating farmers. After a couple of these trials, when the results showed only positive effects, the project no longer paid for costs of the trials, but this had no effect on overall participation. It must be mentioned though that the project supported the participating farmers in the control of diseases in order to minimise variation. The project veterinarian kept the pigs in good health through vaccination, medicine (e.g., for de-worming the animals), and advice to farmers on best practices. A long running relationship was built up with the farmers, and meetings were organised between the project nutritionist, veterinarian, and root crop specialists nearly every week.

Training of farmer-trainers

After five years of research and development work, more and more farmers began adopting some or all of the new technologies to improve their pig production system. A limited number of farmers were involved in the PTD phase, so the farmer-to-farmer training approach was decided on for scaling up the project. Three farmers (one from a local women's union, one from a veterans' association, and one from a farmers' association) from each of seven different communes were invited for four days of farmer-trainer training. The project's long-term collaborators, including two sweet potato breeders, one veterinarian, and one pig nutritionist from various national research institutions and agricultural universities, provided the training.

These 21 farmer-trainers have since conducted training on various subjects, depending on the season and its relevant issues (such as training on sweet potato cultivation at planting season and training on producing and feeding silage during the harvest season), with limited assistance from staff of government institutions. A second farmer-trainer training session was held for other districts, involving the first group of farmer-trainers, with the aim to disseminate the pig production innovations to more farmers. These new training events provided the first farmer-trainers with an occasion to present the results of their training activities and share their experiences with the new trainers, and an opportunity to provide comments and feedback on the curriculum and training methods.

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An earlier version of this article was published in "Participatory Research and Development for Sustainable Agriculture and Natural Resource Management: A Sourcebook" (see Sources section).

Photo: William Critchley

Evelyna Tibemanya harvesting leaves and seeds from her tephrosia bush.

Controlling ticks and influencing policy

Ronald Lutalo and William Critchley

The international PROLINNOVA network seeks to promote local innovation in ecologically-oriented agriculture and natural resource management. While PROLINNOVA is actively engaged in influencing policy at the international level, it also has its feet on the ground – in vibrant country programmes. Uganda is at the forefront of these. With its foundations built on a practical programme of working with local innovators, PROLINNOVA-Uganda reaches out through partner NGOs to the national extension and research agencies in Uganda. The idea is to demonstrate that local innovation, allied with farmer-to-farmer extension, can be part of an overall national strategy in support of small scale farmers. Here we present an example of one of those innovators –Evelyna Tibemanya– with her innovation of a tick and mite-killing solution (an acaricide) derived from a leguminous tree, and then describe how PROLINNOVA-Uganda works at "higher" levels.

An innovator and her innovation

Tephrosia vogelli is a leguminous shrub which has been promoted in Kabale District of south-west Uganda by various research and development organisations. Apparently it was first introduced there by the World Agroforestry Centre (ICRAF) in 1999, and is now widely grown for soil fertility improvement. It is known to thrive at a wide range of altitudes, at least up to 2000 metres above sea level, making it suitable for most agro-ecological zones of Uganda. About 4 - 6 tons of biomass per hectare can be produced in less than a year. If used as mulch, the leaves and small branches release high quantities of plant nutrients, especially nitrogen, on decomposition. Furthermore, tephrosia fixes nitrogen in the soil through its roots. These effects have a significant impact on crop yields when tephrosia is grown as an intercrop or as a short duration fallow crop.

Evelyna Tibemanya observed that crops interplanted with tephrosia were relatively insect-free. At the same time she heard that others were using dried, crushed tephrosia leaves for control of weevils in stored beans. She began to follow their idea – with success. Her stored beans remained free of weevils. So, thought Evelyna, "If tephrosia works against weevils in beans why shouldn't I try it to keep ticks off my pigs?" Although the effect of tephrosia as a tick-killer has been noted before in East Africa, Evelyna was unaware of this, and she came up with the idea independently. After her initial success, she went on to develop a specific concoction of ingredients. Her procedure involves crushing about 250 grams of young, dried tephrosia leaves before mixing in a soap solution. This solution is prepared by dissolving about 100 grams of common laundry soap in 5 litres of water. Mrs. Tibemanya says she uses the soap solution to increase the "stickiness" of the acaricide as well as to remove dirt and skin microbes, thus increasing overall efficiency of the mixture. Five litres of this tephrosia-soap mixture is said to be adequate to treat one large pig, weighing over 50kg.

As we have noted, PROLINNOVA-Uganda works through partners, and in this case the Africa 2000 Network (A2N) is the NGO promoting PROLINNOVA's agenda in south-west Uganda. By happy coincidence, Evelyna is not only one of A2N's client farmers, but she also, literally, houses a community-based library: one of a network set-up under A2N's programme. These libraries are ideal dissemination points for innovative ideas, and it is not surprising that her idea has spread around the neighbourhood, as people have visited her library, walked through her farm and seen this development themselves.

One reason that this particular innovation has taken off locally is that the farming system here (as elsewhere in Uganda) is characterised by low use of external inputs, especially fertilizers and pesticides. This is mainly due to the prohibitive costs, which puts them out of the reach of small-scale farmers. Thus the need for organic pesticides and fertilizers that can provide substitutes for commercial options. Farmer-led action research often yields results that are not only tailor-made to suit farmers' needs, but which are easily acceptable and sustained. Such innovative solutions are most likely to be generated through farmers'

indigenous knowledge and innovative skill – but this process needs to be integrated into the official research agenda. In fact this example is a case in point: the effectiveness of this mixture has not yet been independently verified, nor is the active ingredient of tephrosia known. Researchers are required to take part in joint experimentation to verify this innovation, before wide scale dissemination takes place.

How PROLINNOVA-Uganda works

PROLINNOVA-Uganda began its inception phase in 2003 with a national stakeholders workshop. A "training of trainers" course on Participatory Innovation Development (PID) was organised in August 2004. This event was attended by field officers from NGOs, researchers, representatives of governmental organisations, the Ministry of Agriculture, Animal Industry and Fisheries, and researchers and lecturers from Makerere University in Kampala. This course ended with a session on action planning which included strategy discussions on mainstreaming Participatory Innovation Development into the participants' institutions. One of the action points was to participate in the process of identification and documentation of local innovations in ecologically oriented agriculture and natural resource management. PROLINNOVA-Uganda initially commissioned surveys of local innovations through its core team partners. The areas of focus included organic pesticides, livestock management, bee-keeping, energy conservation, and community mobilisation (social innovation).

The innovations found were submitted to the PROLINNOVA-Uganda core working group, who assessed them and selected those that were most suitable for either immediate dissemination (if they were judged appropriate already) or for "joint experimentation". This process of joint experimentation is either for validation of the innovation – where it is compared with a control to verify whether it is actually better than common practice, or for value addition – where the innovation clearly can be improved. Memorandums of Agreement for the whole process of joint experimentation were considered to be important: these were drafted and shared and signed. They spelt out the various roles of the three partners involved in the process, namely the farmer innovators, the extension agents and researchers. These Agreements also help protect the intellectual property rights of the innovator, by acknowledging his/her role and assuring that any publication includes his/her name and contribution.

Two other innovations and their development

Farmers in the district of Nakasongola are currently trying to control the presence of termites, having opted for the use of predatory ants after a detailed analysis of the options available. And in Wakiso district, a modification to conventional poultry keeping has led to longer laying periods (hence more eggs) and reduced infections, ensuring faster chicken growth. In both these cases, as in others, the entry point to working together was what farmers were already trying: their own efforts to solve their problems. These "entry points", however, do not refer simply to technologies. A closer look at innovation in agriculture has shown that this goes beyond technologies to socio-organisational arrangements such as novel ways of regulating the use of resources, or new forms of stakeholder interaction. The term Participatory Innovation Development (PID) embraces this broader understanding and is gradually replacing Participatory Technology Development (PTD).

Sustaining awareness amongst key decision-makers

Decision makers are made aware of Participatory Innovation Development and local innovation through their involvement in the steering committee of PROLINNOVA-Uganda. In these meetings, the policy makers are briefed about the country programme and progress. Their guidance is sought: this is a two way, participatory process. Pressing policy issues regarding local innovation and support of local innovators, through creation of a favourable policy environment are also raised. Policy makers who are engaged in the steering committee include those from the Ministry of Agriculture, Animal Industry and Fisheries, the National Agricultural Research Organisation, the National Agricultural Advisory Services, local governments, the Uganda National Farmers' Federation, and Makerere University.

To ensure that the Participatory Innovation Development process is sustained, PROLINNOVA-Uganda continues to work with the various stakeholders towards mainstreaming the process. The progress of the institutionalisation process has been followed regularly and capacity gaps have been addressed in subsequent capacity building events. For example, because of incomplete understanding of the joint experimentation process, PROLINNOVA-Uganda organised a workshop for stakeholders on "Joint Experiment Design and Impact Assessment" in April 2006. Interestingly, this workshop stimulated a particular interest amongst participants who are involved in an urban agriculture project: innovation in this field has become an area of potential expansion for PROLINNOVA-Uganda as a result.

Other examples of reaching "up and out" include the sponsoring of two local innovators to participate in the Forum on Agricultural Research in Africa exhibition (held in Uganda in 2005), where they demonstrated and exhibited their innovations -and through this process made connections with the private sector and research institutions. Finally, this year, a series of "topical presentations" at Makerere University began. The idea here is to introduce the concept of local innovation and Participatory Innovation Development to the academic community with a longer term aim of integrating such novel concepts and practices into relevant curricula.

Future directions

Mrs Tibemanya continues to innovate and is planning to experiment with the tick-killing solution for control of ectoparasites in her cattle. She is also sharing her experience and training other farmers on the formulation and use of the tephrosia-based acaricide. Scientific validation of the acaricide has now begun. Evelyna continues to host the library/community resource centre for Africa 2000 Network farmers in Kabale district, and furthermore is actively involved in PROLINNOVA-Uganda events, where she proudly shares her innovation.

It may sound ambitious, but PROLINNOVA-Uganda hopes that its programme will be effective at all levels: within the fields of south-west Uganda, through the corridors of the Ministry, and in the seminar rooms of one of Africa's most revered universities. ■

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Old skills and new ideas in Macedonia

Viktor Janev

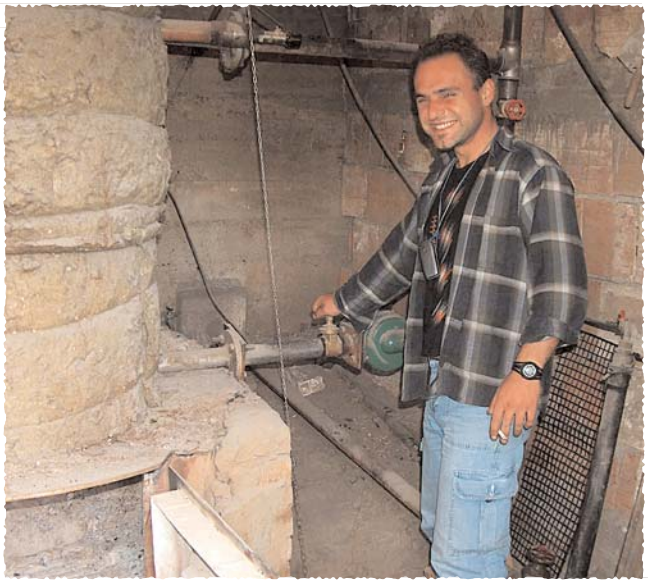

Photo: Author

Mr. Kocevski showing his heating system.

Every year a course in sustainable agriculture is held in Bari, Italy, for in-service professionals from the Mediterranean region. Participants from as far afield as Mauritania, Morocco, Egypt, Palestine, Turkey and the Balkan states gather together at the *Istituto Agronomico Mediterraneo* (CIHEAM), an agronomic institute dedicated to regional development. I am from Macedonia, and in 2004 was fortunate enough to be invited, together with a handful of others from the former Yugoslavia. What I learnt about new approaches to research and extension intrigued me – and especially the two day module on farmer innovation. Could a "farmer innovation approach", I asked myself, be a partial answer to the research and extension problems of my home country? My two months of field work led me to the firm conclusion that the answer is "yes".

My home country is landlocked, mountainous and located in the centre of the Balkans, in south-central Europe. One of the six republics of the former Yugoslavia, the Republic of Macedonia became independent in the early 1990s, seeing itself as a democratic country in transition, with a market-oriented economy. Agriculture is still an important component of the country's economy. More than 80 percent of all arable land is cultivated by small farmers, with an average farm size of one to three hectares. Most land is irrigated, and wheat, maize, tobacco and vegetables are the main crops.

Since independence, the whole country has gone through drastic changes, and these have naturally affected agricultural production. The old model, based on large cooperatives, has been replaced by one which aims to completely privatise all land and agricultural services. Agricultural extension, previously provided free of charge –and even guaranteed by the Constitution– has gradually acquired a private service status, which farmers are asked to pay for. Policies oriented at the "modernisation" of agriculture focus on higher yields and on increasing exports.

Which way to go?

Different studies are currently being carried out, analysing the historical transformation of the research and extension system since independence and its current situation, thus contributing to defining future policies. These have found that farmers are not benefiting much from the research and extension services for different reasons. One reason is that farmers "don't have the habit of paying", another is because farmers find it difficult to afford – with low incomes resulting from low yields, and high prices asked for every visit. At the same time, experts are mainly found in or near the bigger towns, far from rural areas, while governmental extensions agents are poorly paid, and so not really motivated to travel far.

For several decades, agricultural production was strongly influenced by the Green Revolution and, as was traditional in socialist countries, a very intensive and centralised agricultural system developed (with the State providing all necessary information). At the same time, the governmental extension service was modelled on the Transfer of Technology approach. But the changes seen in the last decade have led to new or different difficulties. For example, research information is not readily accessible to producers other than through personal contact and a few extension seminars. Research is still mostly oriented towards large scale operations rather than based on the needs of the much larger community of small scale farmers. According to FAO's Regional Office for Europe, project experiences trying out alternative models have been positively assessed, but continuation and scaling-up lack funding, awareness, and perhaps also commitment.

All these difficulties have led agricultural scientists to explore new approaches to extension, many of which hinge on farmer participation. And that is where my training in Bari fitted in. I wanted to see to what extent farmer innovation was a reality in Macedonia. Are men and women constantly experimenting and putting the results of their experiments into practice to solve their production difficulties? My fieldwork, in the south eastern part of the country, confirmed that this really was the case.

Innovators everywhere

My fieldwork led me to the region of Gevgelija, Valandovo and Strumica with the specific purpose of finding out whether farmers are in fact innovating. This area is famous for its vegetables and fruit, including vineyards, fig and pomegranate plantations, and even tobacco fields. In order to discover whether farmers are developing new production techniques, I simply arranged several meetings with local farmer organisations, and asked for names of members who are known for trying new things out.

Within a few days I had several names and addresses. I visited and interviewed every farmer suggested, finding out what they do which makes them different to others, when did they start, how did they develop these new ideas, and what problems were solved. Even though there were general difficulties with the word "innovation", the results were surprising. Most would not define themselves as innovators, as they were not using new seeds, a new machine or a new irrigations system. But, as the examples here show, it was very clear that most farmers are innovating in order to improve their agricultural production.

Mr. Kiro Kocevski and his heating system

Kiro Kocevski, 48 years old, used to work as a mechanical technician in a local public enterprise near to the small village of Miravci, in the Gevgelija region, where he lives. He left his job 5 years ago and decided to be a farmer. In a small farmyard of only 1400 m^2 he installed a plastic greenhouse for early tomato and cucumber production. He also keeps some chickens and

goats like every village family. He lives with his mother, his wife and two sons, and everyone in his family has an important role in the everyday agricultural activities. During the planting season, the two boys' duty is to collect wood, he and his wife work in the greenhouse and his mother keeps animals. For several years he has been planting half of the greenhouse with tomatoes and half with cucumbers, noticing that his main problem was the price offered for his products on the market.

He soon found out that if he could start his vegetable production in March, two months before the other farmers in the area, he could earn up to three or four times more money. He decided therefore to make his own heating system using wood waste and other waste materials from his farm. He used his knowledge in mechanics and made a steamer that uses wood as fuel, which his two sons collect from the hills around their village during the winter. This heating system is unique around here.

Another of his innovations is that he decided to make his greenhouse smaller than the regular ones in this area. Normally, farmers build greenhouses which are up to 4 meters high, but he thought that it was not necessary to heat such a big volume of air. To decrease heating costs and make it easier to reach the adequate temperature, he made his greenhouse no higher than 2.2 m. As a result of his innovations, when I met him in April 2006, he had already collected tomatoes and cucumbers and sold them on the local markets. His small piece of land yields more than 10 000 kg of vegetables every year, resulting in an income of approximately 10 000 euros. He does not have any other source of income and this business is this family's only livelihood.

Ms Elena Petrovic and the production of a new Petunia
Elena Petrovic, 30 years old, is a young agronomist, who studied agronomy just as her father did. After her father lost his job and she could not find employment, they decided to start growing flowers, mainly petunia (fam. Solanaceae) and chrysanthemum (fam. Asteraceae), as these are species which can easily be sold in the market. They built an 800 m^2 nursery for the production of mother plants, as they found that in the whole of Macedonia it is very difficult to find petunia seeds. Furthermore, they started developing their own varieties, using *in vitro* production techniques. The most famous is the "pending Petunia", although they also made their own varieties of chrysanthemum and sold them very successfully.

Ms Petrovic is now recognised as a person with a lot of experience in flower production, and with their own small business, both Elena and her father have a good enough yearly income. What is most important, according to them, is that they do what they like, and do not rely on the government or an office job.

"EKOPRIMA" and their tomato pest management techniques
"EKOPRIMA" is a new private association of farmers, most of whom were part of the former cooperative "Agro–Izvorski". They work together producing vegetables (especially tomato and cucumbers), for which they bought 12 hectares with modern greenhouses from the cooperative near Bogdanci, 9 km from Gevgelija. Tomato production in this region, especially if it is harvested early in the year, can be very profitable. However, tomato plants are very sensitive to the tomato spotted wilt virus, a problem which appeared several years ago and is now widespread.

One of the main challenges for tomato farmers is controlling the incidence of this virus in a closed area such as a greenhouse. The tomato spotted wilt virus is transmitted by *Thrips tabaci*, a small insect which reproduces very fast. If a farmer can successfully control the population of this insect, the possibility of the virus spreading is reduced. The standard procedure is to spray all plants with insecticide, but this greatly increases the production costs and makes the final product less attractive to the consumers. The insect population is also controlled by a special yellow and blue adhesive tape (insects are attracted by bright flower colours), where insects get stuck and can then be counted, helping farmers to decide if spraying is necessary or not. However, this method is not always accurate, and farmers are not always able to get hold of the coloured tapes. So farmers in "EKOPRIMA" developed a simple method to avoid unnecessary spraying, and at the same time successfully control the population of *Thrips tabaci*. At the end of the season, after all the tomatoes have been harvested, they sow common beans in the greenhouses. The beans attract the insects that are inside the greenhouses, as bean plants are even more attractive than tomato plants or coloured tape. The result is that the virus gets into the bean plants, which can then be sprayed or not, according to the severity of the attack. As an additional benefit, bean plants help with nitrogen fixation.

Building knowledge

While it is true that farmers in this region have many difficulties in getting information, it was easy to see that knowledge is being built everywhere. Depending on the specific situation and needs, farmers are constantly finding ways to solve their problems, increase their production yields and generate better incomes.

My stay in the area of Gevgelija, Valandovo and Strumica showed me that there are no real pre-requisites for innovating. Farmers innovate regardless of their farm size, the crop they specialise in, or the time they have spent farming. My small survey showed that most innovators are between 35 and 45 years old, and that most have secondary or tertiary education, but this does not mean that innovators are not found outside these categories. In fact, innovators and innovations are found virtually everywhere.

Different reasons motivate farmers to start something new. In Macedonia, the transition period has meant that many people lost their jobs, so new ways of farming were tried in order to earn money, even by those who had not been farming previously. Another important reason is early production: in a region where vegetables are the main product, the only way to be competitive in the market is to produce as early as possible, and thus ensure higher prices. Most consider their innovations to be the result of their own ideas, though many also acknowledge the work of others (family members, neighbours) as a source of inspiration.

I believe that farmer innovation needs to be seen as the basic cornerstone of any research and extension system. But how do we go on from here? How can knowledge be built in this context? That is now the challenge, and one that I am committed to struggle with. The starting point is to win the hearts and minds of my colleagues and decision makers in Macedonia. So I have invited my former trainers from Bari to visit Macedonia in November 2006, to talk to a specially convened workshop. But talking alone won't convince, so a field day has been arranged when the participants –farmers and decision makers alike– can see for themselves. Where it goes from there only time will tell.

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Local and "modern" innovations: what interests whom?

Hailu Araya and Yohannes GebreMichael

Ethiopia is one of the nine countries involved in the international network PROLINNOVA (Promoting Local Innovation). The Ethiopian programme, called PROFIEET ("Promoting Farmer Innovation and Experimentation in Ethiopia"), decided to set up teams of governmental and NGO people in different agro-climatic zones. In Tigray, the Northern Typical Highlands (NTH) team was formed between the Mekelle University, the Tigray Bureau of Agriculture and Rural Development (BoARD), the Institute for Sustainable Development (ISD), the Relief Society of Tigray (REST), the Adigrat Diocese Catholic Secretariat (ADCS) and the Tigray Agricultural Research Institute (TARI). This Northern Typical Highlands team brings innovative farmers together around common interests so that they can solve their local problems faster than when working on their own. It also brings them together with formal research and development agents who want to support local innovation processes.

The team takes farmers' innovations as starting points for Participatory Technology Development processes and extension. An exhibition of local and "modern" agricultural innovations revealed that smallholders and formally educated people from research centres and technology workshops have quite different interests. In this article we describe some of the local innovations exhibited and how farmers and other people involved in research and development differently perceive the local and "modern" technologies.

Farming technology exhibition

As part of its regular activities, the Tigray Bureau of Agriculture and Rural Development, together with the "Improving Productivity by Marketing Success" project of the International Livestock Research Institute (ILRI), organised the Agricultural Technologies and Marketing Strategy Exhibition. This was held in the second week of March 2006 in Mekelle, the capital of the Tigray region. Many government agencies, NGOs, private firms and Ethiopian and international research organisations took part. Some organisations brought farmers with whom they are working: either "model farmers" showing introduced technologies, or innovative farmers showing their own technologies. Of the roughly 2500 participants, more than 200 were innovative and model farmers.

As far as we know, this was the first time in Ethiopia that smallholders' technologies were displayed side-by-side with "modern" technologies developed by research and private enterprises. The exhibition also included a five-day workshop, where many papers were presented and discussed.

Photo: Hailu Araya

The Mekelle exhibition.

In one part of the exhibition, experts from the Bureau of Agriculture and Rural Development and farmers from the various districts of Tigray presented different agricultural products, such as pulses, oilseeds, spices, vegetables, fruits and honey. Some processed items, including dairy products, were also exhibited and sold. Many people were buying and

Box 1: Improved beehives and queen rearing

There is a long tradition of beekeeping in Tigray. Traditional hives are made of wood, dung and mud. A few years ago, the government extension programme and REST, a local NGO, introduced wooden top-bar beehives. In the village of Maysuru, in the Ahferom district, REST field staff met a female farmer who has been actively experimenting and innovating in beekeeping. Giday Aregay is in her late 40s and has eight children. Because her husband has been ill for many years, she is responsible for supporting the household through farming and beekeeping.

Giday's oldest son, a schoolteacher, bought her a modern hive for 450 Birr (approximately US$ 50). She earned 200 Birr with the first honey harvest and became convinced that beekeeping could bring a good income. At the same time, she wondered why the hives had to be so expensive, so decided to try making one out of local materials. She measured the "modern" beehive with a stick and then made a replica out of cow dung and mud. She made the frames out of wood, ensuring they were all the same size, so that they could fit into any beehive she made. She used thread from used tyres (sold on the market) to hold the honey comb, replacing the wire used in the "modern" frames. She experimented with frame spacing and discovered she could harvest more honey using fewer frames than in the modern hive. She harvested 40 kg honey from her adapted beehive, 5 kg more than from the modern one. She attributes her better honey harvest and higher production of bee colonies to the insulating effect of the mud and dung during the cold and warm season. She also built hives for queen-bee rearing. Today Giday has 15 beehives: seven to produce honey and eight to produce bee colonies, for which there is a high demand on the local market (each colony sells for 450–500 Birr). Honey and bee colonies are now her main source of income.

sometimes eating the products on the spot. There was also an exhibition of appropriate technologies related to beekeeping, water pumping, irrigation, ploughing, biogas production and much more. These were demonstrated by farmer innovators, extension workers, private firms and NGOs. Information was provided through photos, videos, brochures and pamphlets.

Many of the visitors to the exhibition were attracted by the exhibits of *beles* processing (*Opuntia sp.*), solar technology and silk worms. Farmers, in particular, were interested in what other male and female farmers presented: technologies they had developed themselves. These included, for example, water-lifting devices, subsurface drainage systems, drip irrigation techniques, improved beehive and queen rearing techniques (see Box 1), a single ox plough, or a wild bee domesticating process for obtaining medicinal honey (see Box 2).

Differences in interests and perceptions

It was very interesting to observe how systematically the farmers took in the new information that the exhibition provided. Interviews with many participants and observations during the exhibition revealed that, during a first round on the first day, the farmers looked at all innovations, whatever their origin. At first they were interested only in the technologies, and not in developers of each technology. During second and third rounds on the first day, they sought information about the person or institutions behind each technology, and also gathered other farmers' views. First they met with farmers they already knew, and then started talking with other farmers. They discussed the technologies exhibited: which ones looked easy to apply, asking if anyone had tried the technology and what their experiences were.

On the second day, the farmers selected and focused on the new technologies –whether "modern" or local innovations– that interested them particularly. After the second day, they spent their time trying to find out more about the skills and inputs needed for the technologies they had selected. They visited the exhibits according to their importance: giving most time to the technology which they found most important. After they had gathered all the information they wanted, they felt it was a waste of time to stay longer at the exhibition and workshop. They stressed that the exhibition was very useful for exchanging experiences and learning about new technologies.

But having locally-developed and "modern" exhibits side by side also helped us to see that the interest shown by farmers was not the same as that of other participants. Researchers, agronomists or other professionals were reluctant to visit what smallholders had developed and were interested in. They appeared to be drawn by the newness and attractiveness of "modern" technologies, and looked mainly at their productivity in quantitative terms. The few farmers with some formal education visited both types of technology almost equally.

The majority of farmers present, on the other hand, were drawn to those innovations most useful for small-scale farming. They were interested in the technologies they regarded as effective, easy to apply and inexpensive. They appreciated technologies that lead to higher production, but also asked about the market for the products, especially for more perishable ones like tomatoes. Besides productivity, they wondered about other qualities of the technologies and the knowledge behind them. They asked the local innovators numerous questions: how did you learn this? How long did it take to make it? Are the materials you used easy to find? Does your family understand and like this? What main problems did you observe? What is the cost? When the farmers saw the "modern" implements produced by industrial workshops, they appreciated them but did not ask as many questions as the agricultural professionals did.

There is obviously a gap between the experts and the smallholder farmers in Tigray. This creates a big challenge for groups such as the Northern Typical Highlands team, which try to bring all these actors in agricultural innovation together. The actors in an effective innovation system need to believe in and like each other. Otherwise, they cannot combine forces to make the most of the agricultural potential in Tigray.

Observing how farmers learn from the new technologies exhibited by their peers and by modern workshops and research centres made us realise that most "educated" people in agricultural research and development understand little about what interests smallholders. They do not know what sort of things farmers want to spend their time seeing. We need to observe more closely what farmers are doing in developing their own innovations, and what type of information they seek from others to continue their own process of agricultural development. The exhibition provided a good opportunity to learn how information exchange to support this process can be improved. ■

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Box 2: Domesticating wild bees for medicinal honey

Birhane GebreMariam is 35 years old. He and his wife have five children, some attend school and some herd goats, which Birhane also does. It was while herding five years ago that he, by chance, discovered a nest of tsedina – wild bees that live underground. This bees' honey is used as medicine, e.g. for asthma, fever and heart ailments. The entrance to the tsedina's underground nest is very narrow and not easily seen. Many people seek tsedina, and by digging the nest up and extracting the honey, also destroy it unintentionally. This practice has made them rare in some areas.

When Birhane was young, his mother died of a heart ailment. The medicinal honey needed to treat her could not be found on the local market. Remembering this, when he discovered the tsedina nest, he decided to move it to his farm. One evening, he and two friends dug out a cubic metre of earth which held the nest intact and moved it to the ground near his house. A year later, he started harvesting by lifting a layer of soil and putting it back again so that the hive was not destroyed. The initial harvest was 2.5 litres of honey, which he sold for 150 Birr (approx. US$ 17). Over the years, he moved three more tsedina nests, complete with the surrounding soil, to his homestead.

Birhane now extracts honey regularly, and because of his initiative, the traditional medicine is now available locally whenever needed. He has experimented with moving the hives in different seasons and harvesting at different times. He has learnt that the nests should not be moved during drought or in December/January, and that honey should be harvested only once yearly. But he would still like to learn more about the bees' behaviour, and queen rearing. He would like to join other researchers and investigate the best location of the nests, and also look at competition and harmony between tsedina and normal bees.

Thinking together

Petra Bakewell-Stone

In March 2006, twenty-six key actors in the Tanzanian organic movement met at Sokoine University of Agriculture in Morogoro. Their purpose was to further develop organic agriculture and the workshop was convened as part of an action research study in collaboration with the newly formed Tanzanian Organic Agriculture Movement (TOAM). The experience of this workshop sheds light on ways to stimulate shared action through the creation of shared meaning. The goal of this article is to explore how to free creative potential using participatory methodologies, and to provide ideas for designing interactive meetings that enable people to analyse their situations, envision more desirable futures and strategise in order to make the transition.

Organic sector in Tanzania

Certified organic agriculture emerged in Tanzania in the early 1990s. Although many organic practices are based on traditional knowledge, organic agriculture as a holistic farm management system is a recent concept that is not widely understood. Although in its infancy, the certified organic sector is growing rapidly and is being propelled by smallholder farmers and commercial interests in capturing the expanding organic market. In 2003 the first local certification body, the Tanzanian Organic Certification Association (TanCert) was established in order to certify organic products for both the domestic and international market. At present, estimates of the certified land area range from 37 000 to over 64 000 hectares, comprising approximately 27 000 farms.

Certified organic agriculture in Tanzania is predominantly export-oriented. The focus is on traditional commodity crops such as coffee, tea, cocoa, cashew nuts and cotton and non-traditional crops such as vanilla, sesame, herbs and spices which are often processed. Fruit and vegetables are also becoming increasingly important. There are now at least 23 certified organic projects in Tanzania, including 16 firms for export and 7 projects for the local market. Most projects follow an out-grower model in which smallholders are contracted by exporting companies who pay for certification, sometimes in collaboration with donor programmes. There are also a few individuals farming organically on a large-scale and two cooperatives engaged in organic coffee production.

The need for coordinated action

The main stakeholder groups in certified organic projects are farmer organisations, companies, facilitating agencies and certifying bodies. Consumers, government extensionists, policy-makers and research institutions also play important roles in developing the organic sector.

The Tanzanian Organic Agriculture Movement network, established as a platform for exchange and promotion of organic agriculture, has identified the lack of coordination amongst the different types of actors working in the emerging organic sector, as a major weakness. Improving communication and collaboration between those active in organic projects is important for developing an organic agriculture that balances economic concerns with those of the environment and the livelihoods of smallholder farmers.

Tanzanian Organic Stakeholders' Forum

The idea to hold a forum arose from this need to address the lack of coordination amongst stakeholders, and in order to bring unity and direction to the national organic movement. Three main objectives of the workshop were: to share and synthesise knowledge on organic food and farming; to create a shared vision for the future of the sector; and to formulate individual and joint action plans for achieving this vision.

Photo: Author

Amaranth and many other vegetables are increasingly grown organically in Tanzania.

The design of the workshop, inspired by the Soft Systems Methodology, included the following stages:

Preparation
Participants were selected on the basis of belonging to diverse stakeholder groups, representing different organisations, long-term involvement in organic agriculture, and in order to bring an age and gender balance. Detailed planning of the workshop involved articulating the purpose, process and desired outcomes of each individual session. In order to make the workshop interactive the majority of sessions were focused group discussions, in an informal arrangement based on the World Café method.

Defining the relevant system
In order to clarify the context, specialists gave short presentations on the history and background of organic agriculture in Tanzania, current research activities, curricula development and international issues. These presentations and plenary discussions helped participants to develop a common understanding of the issues.

Analysing constraints and opportunities
A successful vision uses "creative tension", the tension between vision and reality, to lift organisations and communities out of the mundane. The aim is to "hold" visions while remaining committed to seeing current reality clearly. For this reason, it is important to have a sound understanding of system weaknesses and constraints *before* creating positive mental images of the future.

Challenges to strengthening organic agriculture were identified through the use of guided conversations around the question: "What challenge, if resolved, would radically improve the state of organic agriculture in your area?" These challenges were then grouped thematically according to TOAM's pillars of action which include market development, standards and certification, research and education, policy and legislation, institutional development, and production and processing.

Visioning
Visioning involves establishing an overarching goal that is harmonious with our core values and sense of purpose. At its simplest level, a shared vision is the answer to the question: What do we want to create? In the Tanzanian Organic Stakeholders' Forum the purpose of visioning was to build consensus on the future direction of activities and to focus the strategic agenda for action planning.

The process involved first setting the scene by asking participants to sit comfortably, preferably with eyes closed and legs uncrossed. A short story was then read to them. This skeletal story-line can be adapted and embellished to add colour and breathe life into the exercise. Important points to remember include speaking slowly, including adequate pauses for participants to adequately visualise, and posing broad and open-ended questions that do not constrain imaginative thinking.

> *"It is the year 2015. An exciting organic initiative that you have been involved with for many years has been more successful than you ever anticipated. It has gained widespread support from the local community. Generous partners have contributed a wealth of expertise and support. The initiative has become a model for the development of organic agriculture in Tanzania, and there has also been mounting interest from farmers, the government, researchers, journalists and the general public. What has taken place? How has the system changed in your area?"*

After allowing participants to visualise this situation individually and in as much detail as possible, they were invited to create symbols such as words or images that represented different aspects of their visions and jot these down on paper.

Visualisation was followed by sharing in groups, with participants listening carefully to one another's visions and incorporating aspects that resonated with all into a shared vision that was mapped out on a flipchart.

Once participants were satisfied that key elements of their visions had been represented, group members were asked to circulate around other flipcharts leaving one "host" who remained at the table to explain the group vision to "visitor" participants. Afterwards they returned to their home tables and gave feedback that could enrich the group vision. This was summarised as a vision statement phrased as: "To have an organic sector that ..." and written in big block letters on A3 paper. Table hosts then presented the group visions to the plenary whilst underlining key words.

On this basis, central elements of all the group visions were incorporated into an overall shared vision that was further discussed and refined. In this process, the facilitator is supposed to build a shared vision that reflects personal visions and is rooted in individuals' values, concerns and aspirations, thereby connecting people to an important undertaking.

Articulating strategies

Following the visioning session, the groups developed strategies and formulated action plans around the challenges and themes previously identified. The cornerstones of the shared vision –health, environment and income– provided the ultimate goals of all the action plans. Participants considered the forces supporting and hindering their efforts to realise the shared vision when choosing various courses of action. During the coffee break participants paired up to discuss whether the action plans being formulated were New, Appealing and Possible – a useful little tool nicknamed NAP analysis. For example, the group which decided to strategise on market development resolved to increase trade and income from organic products by establishing local market centres by 2008.

The workshop concluded with a press conference which consisted of presentations by a panel of six speakers from different stakeholder groups followed by a question-and-answer session.

Evaluation

Simple methods can be used to evaluate a workshop such as this one. Feedback from participants indicated that the workshop was extremely useful for stimulating networking, although it is still early to evaluate whether the workshop will lead to effective partnerships and joint action in the long-term.

Outcomes

Tangible outputs of the process were a shared Organic Vision 2015 (see box), individual plans of action, joint strategies and media coverage in the form of radio and television bulletins and articles. Participants also left with their own individual visions, either written down or in their heads, which they can refer to in the future as a source of inspiration and direction.

Tanzanian Organic Vision 2015

"To have a vibrant organic sector supported by a wide range of stakeholders that is the driving force behind agriculture in the country, takes advantage of local and export markets and contributes to enhanced livelihoods through quality and safe food, environmental conservation, economic growth and sustainable development."

As a result of broad-based participation, the shared vision represents a wide range of stakeholders. These include: educators who advocate for improved curricula, research facilities and learning institutions; farmers who seek better prices, more efficient production systems and easier access to certification, and; traders who want to make sure that domestic markets develop and export market services are available.

The next step could involve incorporating the tangible outcomes into strategic plans, organising regular stakeholder forums and reinforcing partnerships around common concerns. For example, the workshop catalysed the meeting of representatives from producer groups, organic support groups and certifiers, paving the way for future collaboration on establishing Internal Control Systems for smallholder group certification.

On the basis of participants' evaluation, however, the most significant outcome that emerged from the workshop is intangible: enhanced networking and communication amongst stakeholders.

Conclusion

Creating a shared vision is one way of building the capacity of communities to adapt, survive and thrive, into an unknowable future. As shown in this example, visioning can bring coherence to the activities of diverse stakeholders and create the incentive and basis for participatory planning. By holding workshops which integrate knowledge from many different sources and which offer opportunities for joint learning among relevant social actors, the foundations for successful innovation, or collective social competence, are laid. ■

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Photo: Jon Hellin

Women are active participants in the Kamayoq school and some have become Kamayoqs themselves.

The Kamayoq in Peru: farmer-to-farmer extension and experimentation

Jon Hellin, Carlos De la Torre, Javier Coello and Daniel Rodríguez

Governments have largely been responsible for research and the provision of extension services in Latin America. The emphasis has been on the transfer of technology, paying little attention to farmer innovation and experimentation. During the 1990s, however, structural adjustments led to a breaking down of classical agricultural research and extension services, to the extent that these services are now unable to address the needs of farmers living in marginal environments. In Peru, for example, the government agricultural extension programme run by what is now the *Instituto Nacional de Investigación Agraria* (INIA) employed 1400 extension officers in 1986, but fewer than 100 officers in 1992.

Private research and extension provision was expected to replace that previously provided by government. Few resource-poor farmers, however, are able to pay for this service and, as a result, it has generally been directed at larger commercial farmers. However, there have been a number of less well-known extension initiatives that have been able to address smallholder farmers' development needs. The defining characteristic of these initiatives has been the training of farmer-to-farmer extension agents who both provide technical advice and encourage farmer innovation and experimentation. One such initiative is the *Kamayoq* in the highlands of Peru.

The Kamayoq and provision of extension services

Since the 1990s, Practical Action (formerly known as ITDG), a non-government development organisation, has been working in Quechua-speaking farming communities in the Peruvian Andes. Initially, the focus was on communities living in the valleys above 3500 metres. Here, the most common crops are maize, potatoes and beans. Many families also have one or two head of cattle each, some sheep and a number of guinea pigs (a food staple in the Andes). Since 2003, the focus of Practical Action's work has broadened to include communities living at over 4000 m, where livelihoods depend on a combination of alpaca-raising and potatoes.

For over 500 years, the Quechua, like most Latin American indigenous peoples, have been undervalued and marginalised. Practical Action recognised that one of the most effective ways to address farmers' needs was through a farmer-to-farmer extension approach that also encouraged farmer experimentation. Influenced by the pedagogic approach of the Brazilian educator Paulo Freire, Practical Action had had some experience with this approach in Kenya, where it had been involved in the training of "bare-footed" vets. In Peru, Practical Action developed a similar training approach: one that respects the cultural and social context of local farmers and which places an emphasis on active farmer participation and learning by doing.

In the early 1990s, Practical Action began to train a number of farmer extension agents, known locally as *Kamayoq,* focusing initially on irrigation techniques. The word *Kamayoq* actually dates from the time of the Inca Empire: they were a group of respected people who were able to predict the climate and, hence, were responsible for recommending suitable dates for sowing and other agricultural activities. In recognition of their importance, the *Kamayoq* were given food and land by the Inca State. The use of the word *Kamayoq* in Practical Action's work reflects a link to the Quechua people's historical past.

By the mid-1990s, Practical Action had recognised that smallholder farmers' needs could best be met by broadening the focus beyond irrigation. In 1996, the project being implemented received increased donor funding and established a *Kamayoq* school in Sicuani, 140 km south of the city of Cusco, with the objective of training a group of farmers who would then be responsible for training other villagers. The school has been operating ever since. The farmers who receive training are selected by their communities, although there are a number of criteria that have to be met before a farmer can enrol at the school: the farmer has to be dedicated to agriculture, live in an agricultural community, and be an active member of that community. There is also a preference for farmers who are married and with children. There are no requirements, however, with respect to educational level, age or proficiency in Spanish. The *Kamayoq* are expected to return to their villages and train neighbouring farmers in many of the techniques that they have learnt at the *Kamayoq* school.

Practical Action has ensured that the *Kamayoq* do not become the promoters of off-the-shelf technologies. On the contrary, the objective is to encourage the *Kamayoq* to work with farmers to generate creative solutions to local agricultural and veterinary problems, a process known as Participatory Technology Development (PTD). This is important for two main reasons: firstly, active farmer participation is widely recognised as one of the key components of rural development. The confidence that comes from participation increases farmers' ability to learn and experiment. Second, the ability to innovate is vital because biophysical, social and economic conditions change and farmers need to be able to adapt to these changing circumstances. Furthermore, farming conditions in the Andes are so complex and diverse that it is difficult to find a ready-to-use technology that needs no further adaptation.

A successful extension programme is therefore more likely to involve active farmer participation and to be characterised by joint problem solving rather than standardised solutions. This philosophy has been instilled in the *Kamayoq* from the beginning. The *Kamayoq* are encouraged to see themselves as key players in a two-way flow of information from the individuals and institutions promoting development, and from the local farmers to these same individuals and organisations. In this sense, the *Kamayoq* can be seen as facilitating the inter-cultural communication between the Quechua and the Spanish worlds.

The Kamayoq school

Training courses at the school take place over an eight-month period, during which there are approximately 27 training sessions. To date, approximately 200 *Kamayoq* have been trained, of whom 15 percent are women. At the school, training partly takes place in the classroom (in Sicuani), but mainly in different field locations so that the *Kamayoq* can "learn by doing". Workshops take place in different communities, each of which has specialised in one or more key technologies. Instructors at the school include staff from Practical Action, long-serving *Kamayoq* and experts from regional universities in the cities of Puno and Cusco. During the training, the *Kamayoq* also visit INIA's experimental stations, other NGOs working in the region, as well as large-scale farmers. Throughout their training, the *Kamayoq* establish contact with technical experts from the private and public sectors and with other farmers, a useful network which they can tap into when they need information and technical advice once they finish their training. This "social capital" is recognised by many as one of the greatest benefits of the whole course.

At the end of each eight-month course there is an internal evaluation. The evaluation covers the content of the training as well as the quality of the trainers. Based on this evaluation the following year's course is revised. For example, in 1996-1997 the school focused on five technical themes: irrigation, Andean crops, horticulture, livestock and forestry. These themes were selected on the basis of the agricultural needs of local farmers. As a result of the evaluation, the course was amended, and agro-industry and marketing was added as a sixth technical speciality area after 2000. This new area included subjects such as the elaboration of business plans for small agricultural businesses as

The Kamayoq and the search for a natural medicine

One of the biggest problems in sheep and cattle in the Andes is the parasitic disease Fasciola hepatica, commonly known as "sheep liver fluke." This is a somewhat misleading name because the parasite is commonly found in cattle and guinea pigs, as well as in sheep. The vector responsible for the spread of the parasite is the common snail. Although F. hepatica rarely kills animals, it does incapacitate them (sick animals often weigh a third less than healthy ones). Infected bulls sell for under US$ 70 per animal, while healthy bulls sell for US$ 115 each. In the case of cows, there is a reduction of over 50 percent in milk production from infected animals. Weakened animals are also susceptible to a number of secondary diseases.

Few farm families can afford conventional medicines to control the disease. F. hepatica, therefore, represents a real threat to local people's livelihoods. The discovery of a natural medicine to treat and control F. hepatica depended on a process of participatory research and development guided by the Kamayoq. A natural cure for F. hepatica in sheep was earlier discovered by Apolinar Tayro, a farmer from the community of Pampa Phalla who later became a Kamayoq. Between 1998 and 2000, the same farmer, along with Practical Action, national researchers and local villagers, experimented with a cure for F. hepatica in cattle as opposed to just sheep. Farmers played a direct and active role throughout. Farmers focused on a number of plants that were known to have medicinal properties. They tested medicines made from different combinations of these plants on their own infected animals. Experiments were designed to ensure that any treatment could subsequently be easily prepared and administered by the farmers themselves. The medicine, which contains garlic and artichoke, is administered to the animals in oral form. Farmers are now involved in experiments to find a cure for F. hepatica in alpacas.

The widespread use of the medicine has led to fewer sick animals, higher milk yields and diversification into a range of milk products including yoghurt and cheese. The natural medicine is also cheaper than conventional medicines. The cost of treating a sick animal with conventional medicine is approximately US$ 2.5 per animal. In the case of the natural medicine, it is US$ 0.60 per animal. We estimate that over 3000 families now use the natural medicine for controlling F. hepatica in the highland provinces near to Sicuani, and that villagers have treated approximately 30 000 cattle and 7000 sheep.

well as agrarian law. In all, the six technical themes currently cover topics ranging from soil fertility to greenhouse vegetable production and cheese-making.

Language was an issue that was often mentioned in the earlier evaluations. The *Kamayoq* suggested that more Quechua and less Spanish be used in the trainings. There was also a request that the trainers used simpler words. The use of an alienating language, Spanish, is a particular issue for women. Hence, since the 1999-2000 course, the school also provides courses in the grammar and writing of Quechua.

The key to the success of the *Kamayoq* model is that farmers highly value the assistance provided by their fellow *Kamayoq* and are willing and able to pay for this assistance. Farmers pay the *Kamayoq* for their services in cash, in kind or in the promise of future help through an indigenous system known as "*ayni*". It is farmers' willingness to pay that makes the *Kamayoq* model so interesting. It is largely an unsubsidised farmer-to-farmer extension service with external financial resources only being needed to cover the cost of the training provided at the *Kamayoq* school.

Photo: Jon Hellin

The Kamayoq are involved in many activities. Here, they are providing advice on honey production.

Combining participatory research and development and farmer-to-farmer extension

Local farmers and *Kamayoq* work together to resolve priority agricultural problems. To date, examples of successful participatory research and development initiatives have included the treatment of a maize fungus disease; the control of mildew on onions; and treatment of animal diseases. The most sought-after service is the last of these, i.e. the diagnosis and treatment of various animal diseases. In each of the communities where *Kamayoq* live and work, mortality rates among sheep and cattle have fallen dramatically. One of the most interesting results of farmer innovation and experimentation has been the development of a natural medicine to control the "sheep liver fluke" (see Box p. 33).

Impact and scaling-up

The *Kamayoq* school is not expensive to run, and in some cases the *Kamayoq* are able to pay for part of their training. Still, it is unrealistic to expect them to cover more than a small percentage, so the continued success of this development initiative requires external funding. Another difficulty has been trying to get the support of the local government, or linking this experience with the existing technical schools found in the region. Many of these have discontinued their agricultural courses due to less demand, while the national government has still not defined a clear strategy towards extension or agricultural development.

However, the impacts of the *Kamayoq* are overwhelmingly positive. While farmers in this region used to produce only subsistence crops, they now, particularly the women, produce both subsistence crops and also onion and carrots, which they sell in the market. A very positive result is that most families have tended to use the increased income from market sales to pay for the education of their children.

At the same time, farmers are better able to detect animal diseases and take evasive action. In the past, they would often wait until the animals were sick and then seek a technician who tended to over-charge them, or just let the animals die. As mentioned, in the farming communities where the *Kamayoq* have been active, mortality rates among cattle have fallen dramatically. There is also evidence that the improvement in food security (brought about by improved agricultural and animal production) has led to the more sustainable use of natural resources.

More importantly, there has been an increase in self-confidence among the *Kamayoq* and the farmers who have been attended by the *Kamayoq*. Most seem willing to take part in local trials and experiments, something that has led, for example, to them growing other crops. In 1998, a group of trained *Kamayoq* established the legally-recognised "*Asociación Kamayoq Toribio Quispe*", as an organisation which could represent them. The *Kamayoq* are increasingly being contracted by public and private organisations to extend the farmer-to-farmer training well beyond the communities and region where the *Kamayoq* have operated to date. In these cases, the *Kamayoq* are paid to act as technical instructors and the *Kamayoq* association facilitates this process. ■

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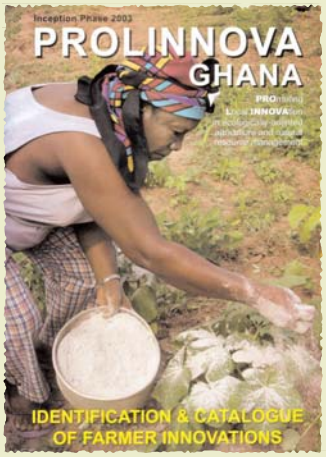


Identifying and cataloguing farmer innovations

Ruth Tagoe

Farmers in southern Ghana, as everywhere in the world, are constantly developing ways to solve the problems they face, or finding ways to cope with the difficulties they have in farming or in managing their resources. However, these innovations are not generally known or considered by researchers or extensionists working in the same region, and often, neither are they known by other farmers facing the same difficulties. In order to share the most interesting initiatives and exchange valuable information, PROLINNOVA Ghana started a process aiming to identify and catalogue farmer innovations in the southern half of the country. Starting in 2004, this process took place in the Volta, Western and Central regions, hoping to create awareness of what farmers are doing, and to strengthen partnerships between farmers, development organisations and research scientists.

As a field extensionist working for the Ministry of Agriculture, I was asked to look for farmers with interesting innovations. This was not easy at first, even though I know the area where I work quite well. Not everybody recognises what "innovation" means, so I had to start by asking for someone who is doing "something new". Some would refer to something they tried once, and which is not visible anymore. And many farmers found it difficult to differentiate what they have tried and done on their own from what somebody had told them. But the process got easier and easier, and after a couple of months I had approximately 50 cases, all of which were presented to PROLINNOVA. These were ranked according to various criteria (usefulness, replicability), and field visits were organised to the ten most interesting cases. Farmers were then asked to provide further information, answering our questions in detail, and showing what they had done. We took photographs and wrote the texts for a small catalogue, trying to present each case as clearly as possible.

While the catalogue was being prepared, some of these farmers were also invited to present their innovations in different exhibitions. The first was during the World Food Day celebrations of 2005, held in the capital, Accra. Together with farmers from different parts of the country, Mr. Kwame Tetteh, one of the farmers on our list, presented a cashew nut cracker and a cashew nut oil extractor which he designed himself. Three weeks later, in November 2005, a workshop was organised in Koforidua, in the Eastern Region, with the similar intention of showing new ideas of indigenous origin, and to exchange and disseminate this information. Four of "our" farmers joined a group of more than 50 innovators, showing some of their innovations and ideas: vaccines prepared from local herbs and chilli pepper, the use of herbs, neem and myrrh to preserve smoked fish, the use of cocoa pods to increase soil fertility, or the use of plantain pseudo-stems for mulching in the dry season.

A third exhibition was organised in Cape Coast in June 2006, bringing farmers together from all of southern Ghana. By then, the catalogue was ready, so farmers were able to see other farmers' innovations, and also see themselves and other farmers in a small booklet. This catalogue is now being distributed all over the country, creating overall awareness of farmer innovativeness, and inducing other innovators to show what they are doing. Further dissemination takes place via the radio: every week, the Ministry of Agriculture has a one-hour programme in Radio Central FM in Cape Coast. There I am able to describe what we have found, and to highlight the importance of farmer innovations.

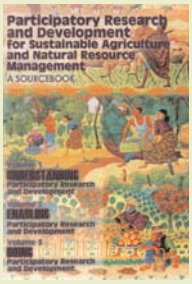
Although we have only recently begun to distribute the catalogue, the results of this process of collection, documentation and exchange are already visible. Many farmers were present at the different exhibitions and saw what the innovators were showing. They were also able to talk to them, ask all sorts of questions, and then try something similar in their own farms. Going back to the field, it is very interesting to see farmers already trying out someone else's idea.

Needless to say, documenting innovations is not an easy process. Farmers generally do not keep records, while it may be essential to consider input quantities, concentrations, or the energy or effort required for each case. And effective innovations dealing with a particular process, such a pest, are easily lost once the problem has been dealt with successfully. Other stakeholders are not generally keen to participate, while farmers themselves have very little time to spend talking about what they do, or even attending exhibitions. Because they are so busy, organising the exhibitions was equally difficult. Nevertheless, we are sure of a positive impact: by seeing themselves in a catalogue, farmers feel acknowledged and rewarded for their efforts. By seeing their neighbours or other villagers, farmers are motivated to share what they have discovered or innovated. Most are interested in trying new things out. And even though getting extensionists or researchers interested in what farmers are doing is still a challenge, we feel that it is easier if they are able to see, in a clear and well presented format, what farmers are trying out and achieving. Bringing to light new ideas of indigenous origin is surely a positive step. ■

Ruth Ayikaikai Tagoe. District Agriculture Officer, Ministry of Food and Agriculture. P.O. Box 503, Cape Coast, Ghana. E-mail: tarage510@yahoo.com

Participatory research and development for sustainable agriculture and natural resource management : a sourcebook. Volume 1 "Understanding", Volume 2 "Enabling", Volume 3 "Doing" by Julian Gonsalves et al. (eds.), 2005. 248 p. ISBN 971 6140304. Users Perspectives with Agricultural Research and Development (UPWARD) / International Development Research Centre (IDRC). P.O. Box 933, Manila, The Philippines. E-mail: cip-manila@cgiar.org

The three volumes which constitute this sourcebook aim to inspire and guide aspiring and new practitioners of Participatory Research and Development (PR&D) to learn, reflect and constantly refine the way they work. The target users are field-based researchers in developing countries involved in natural resource management, agriculture and rural livelihoods activities. The book is intended to enhance access to information on field-tested PR&D concepts and practices among field practitioners and their organisations. It is envisioned as a general reference and comprehensive overview, showcasing the rich diversity of perspectives on PR&D. The printed version of the book consists of three volumes in a box, and is accompanied by a CD ROM which provides all the papers in digital form (pdf files). *The three volumes are available at* http://www.*cip-upward.org and* http://www.*idrc.ca sites. A Spanish edition of the sourcebook will be available from September 2006. For inquiries, contact CIP-UPWARD as above.*

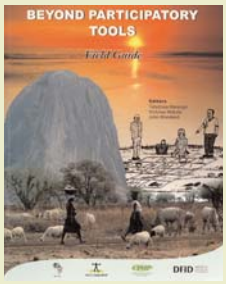


Agroecological innovations: increasing food production with participatory development by Norman Uphoff (ed.), 2002. 306 p. ISBN 1 85383 857 8. Earthscan, 8-12 Camden High Street, London NW1 0JH, U.K. E-mail: earthinfo@earthscan.co.uk ; http://www.earthscan.co.uk

This book presents a collection of innovative, successful and diverse approaches to agricultural development. Documented in 12 case studies from Africa, Asia and Latin America, these approaches draw upon greater knowledge, skills and labour input, rather than on larger, unsustainable capital expenditure, and are shown to increase yields substantially, sometimes doubling or tripling output. This volume presents both key concepts and operational means for reorienting agricultural efforts towards more environmentally friendly and socially desirable approaches to the pressing problem of food security in the developed as well as the developing world.

Beyond participatory tools: field guide by Tafadzwa Marange, Mutizwa Mukute and John Woodend (eds.), 2006. 66 p. ISBN 0797431195. DFID Crop Post-Harvest Programme Southern Africa, P.O. Box CY 2855, Causeway, Harare, Zimbabwe. E-mail: tafadzwa@ecoweb.org.zw

Primarily intended for development facilitators who work directly with communities, this field guide was written because of the growing evidence that many people who use participatory tools need more understanding of why they are using them, not just how. It provides a good understanding of what lies behind the tools, which should allow us to question them, adapt them and develop them further. The manual is experience-based and draws on the various experiences of three organisations (PELUM, the DFID Crop Post Harvest Programme, and VECO Zimbabwe) and the partners they have worked with in eastern and southern Africa where the social, ecological and political conditions are similar.



Participatory Technology Development (PTD): linking indigenous knowledge and biodiversity for sustainable livelihoods by Maruja Salas, Xu Jianchu and Timmi Tillmann, 2003. 176 p. ISBN 7541618713. Yunnan Science and Technology Press, Press Building, Huanchengxilu No. 609, Kunming, Yunnan 6500034, China. E-mail: contactus@cbik.ac.cn ; http://www.cbik.ac.cn

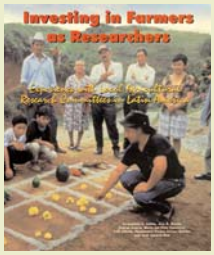
Participatory Technology Development (PTD) aims to strategically enhance indigenous knowledge as a means of generating indigenous innovations and to support indigenous innovators in their socio-cultural and biophysical contexts. Providing training material for capacity building of community facilitators, researchers and technicians, this field manual aims to aid field practitioners working with ethnic communities in Southeast Asia and Southwest China. It is based on an adaptation of the PTD approach to a learning process undertaken in eight villages in Xishuangbanna, a tropical rain forest area of Yunnan populated by several ethnic minorities whose livelihoods are undergoing externally driven changes.

Unlocking farmers' potential: institutionalising farmer participatory research and extension in Southern Ethiopia by Ejiga Jonfa and Ann Waters-Bayer, 2005. 32 p. ISBN 190402906X. FARM-Africa Project Experiences Series. FARM Africa, 9-10 Southhampton Place, London WC1A 2EA, U.K. E-mail: farmafrica@farmafrica.org.uk ; http://www.farmafrica.org.uk

The second number of FARM-Africa's "Project Experience Series", this document reports the key experiences and lessons learned during the implementation of a project on Farmer Participatory Research (FPR) in Ethiopia. Carried out by FARM-Africa and various partner organisations concerned with agricultural research, development and education, this project focused on establishing a wide base of knowledge and skills in FPR and creating an enabling environment for applying the approach. A large number of government staff were trained in FPR, and many farmer led participatory on-farm trials were supported. The four years of the project were an intensive learning process for all partners involved. The key elements that supported the institutionalisation process were identified and valuable lessons were generated from the gained experiences.

Investing in farmers as researchers: experiences with local agricultural research committees in Latin America by Jacqueline Ashby, et al., 2000. 199 p. ISBN 9586940306. CIAT, Publications Distribution Office, Apartado Aéreo 6713, Cali, Colombia. E-mail: ciat@cgiar.org ; http:// www.ciat.cgiar.org

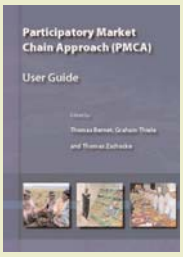
A Local Agricultural Research Committee, or CIAL is a farmer-run research service that is answerable to the local community. The community elects a committee of farmers, the CIAL, which conducts research on priority topics and reports its results back to the community. Both the CIAL members and the community benefit from this approach. This report describes the history and results of a number of CIALs in Ecuador and Colombia. It is an impressive example of how poor farmers can help themselves and their community to increase food security. The report ends with a long list of research topics investigated by CIALs all over Latin America, including the development of local crop varieties, resistance to pests or adaptation to local soil conditions and evaluation of livestock diets. There is also a bibliography with training materials and manuals.



Farmer innovation in Africa: a source of inspiration for agricultural development by Chris Reij and Ann Waters-Bayer (eds.), 2001. 362 p. ISBN 1853838160. Earthscan, 8-12 Camden High Street, London NW1 0JH, U.K. E-mail: earthinfo@earthscan.co.uk ; http://www.earthscan.co.uk

As mentioned, "one of Africa's major untapped resources is the creativity of its farmers". Based on fieldwork in a wide variety of farming systems throughout Africa, this book demonstrates how small-scale farmers, both men and women, experiment and innovate in order to improve their livelihoods. The examples show that innovation takes place despite the adverse conditions and lack of appropriate external support. The studies have been written primarily by African researchers and extension specialists, covering countries as diverse as Tunisia and Cameroon, Ethiopia and Zimbabwe.

Participatory Market Chain Approach (PMCA) – User guide by Thomas Bernet, Graham Thiele and Thomas Zschocke, 2006. 184 p. ISBN: 9290602651. International Potato Center, Apartado 1558, Lima 12, Peru. E-mail: cip@cgiar.org ; http://www.cipotato.org ; http://papandina.cip.cgiar.org/fileadmin/PMCA/User-Guide.pdf



This manual describes a new R&D method designed to stimulate innovation along market chains by enhancing stakeholder collaboration and trust. This method grew out of a joint effort made by different R&D organisations and projects, with the aim of finding new ways of intervening in market chains and improving poor farmers' livelihoods. It provides useful tips for applying the concepts it presents, together with examples of how the approach has been used in the Andes of South America.

Pathways to participation: reflections on PRA by Andrea Cornwall and Garett Pratt (eds.), 2003. 217 p. ISBN 1853395692. ITDG Publishing, Bourton Hall, Bourton-On-Dunsmore, Rugby, Warwickshire CV23 9QZ, U.K. E-mail: info@itpubs.org.uk ; http://www.developmentbookshop.com

With more than 30 contributions, this book brings together the reflections of a diversity of development professionals from different generations and arenas of development work, cultural and political contexts and professional backgrounds. All have engaged with Participatory Rural Appraisal (PRA), in one way or another, whether as practitioners, trainers, donors, academics or activists. Embracing a range of entry points and experiences, their stories speak of moments of frustration and revelation, of dilemmas and discoveries. Their pathways to participation have shaped their perspectives on PRA, as well as vice versa. Together their accounts provide the variety of practices that have come to be called PRA.

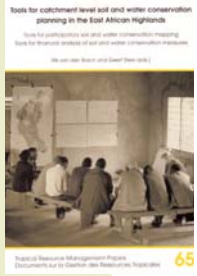
Enabling innovation: a practical guide to understanding and fostering technological change by Boru Douthwaite, 2002. 256 p. ISBN 1856499723. Zed Books, 7 Cynthia Street, London N1 9JF, U.K. E-mail: enquiries@zedbooks.demon.co.uk ; http://www.zedbooks.co.uk

This book is an account of some of the disaster, and success, stories around technological development and diffusion from both industrial and developing countries. It tells the story of very different technologies including agricultural appliances, wind turbines and Green Revolution high yielding seeds. Little is known about the social and human processes - if those who will use the innovation are involved in technological adaptation and adoption, will the result be both better technologies and their more rapid adoption? The author has constructed a "how to do it" guide to innovation management that tries to counter many of the top-down development assumptions of today.

Science, agriculture and research: a compromised participation? by William Buhler, Stephen Morse, Eddie Arthur, Susannah Bolton and Judy Mann, 2002. 163 p. ISBN 1853836915. Earthscan, 8-12 Camden High Street, London NW1 0JH, U.K. E-mail: earthinfo@earthscan.co.uk ; http://www.earthscan.co.uk

Agricultural research is a wide subject area therefore the approach the authors have taken is illustrative and general rather than fully comprehensive. The aim is to inform and broaden debate surrounding agricultural research and what drives it. In this book agricultural researchers explain what is involved: why they do what they do, what drives the research methods and agenda, who funds it and how the system functions. Using a historical analysis based on two main case studies (the U.K. and Nigeria) an interesting comparison of the evolution of agricultural research in the developed and developing world is made. The authors use this to explore some of the many complexities and trade-offs in the field of agricultural scientific work.

Tools for catchment level soil and water conservation planning in the East African highlands: Tools for participatory soil and water conservation mapping: Tools for financial analysis of soil and water conservation measures by Rik van den Bosch and Geert Sterk (eds.), 2005. 115 p. ISBN 9067549959. Tropical Resource Management Papers 62. Wageningen University and Research Centre, Nieuwe Kanaal 11, 6709 PA Wageningen, The Netherlands. E-mail: jolanda.hendriks@wur.nl ; http://www.dow.wau.nl/eswc



The "Development of an improved method for soil and water conservation planning at catchment scale in East African highlands" project developed two new tools which can be employed within the daily context of the extension services in Kenya and Tanzania. The methods were developed together with the farmers and representatives of the extension services. This report describes the developed tools and their potential use within the current extension approaches for natural resource management in Kenya and Tanzania.

Farmer centered innovation development: experiences and challenges from South Asia by Annette Kolff, Laurens van Veldhuizen and Chesha Wettasinha (eds.), 2005. 155 p. ISBN 9843226747. SDC and Intercooperation, P.O. Box 6724, CH-3001 Berne, Switzerland. E-mail: info@intercooperation.ch ; http://www.intercooperation.ch

The regional workshop on farmer-centred introduction of innovations, held in Bogra, Bangladesh in 2004, involved participants from Bangladesh, India, Pakistan and Nepal. This document contains the proceedings and papers presented. It aims at sharing insights of the process prior to and during the workshop and analyses concepts and working principles of participatory methods. The discussions and papers presented provide experiences with spreading and scaling up, the role of community based organisations, and institutionalisation of participatory innovation development.

Open Knowledge Network

http://www.openknowledge.net/

OneWorld UK, 2nd Floor, River House, 143-145 Farringdon Road, London EC1R 3AB, U.K.

The Open Knowledge Network is an initiative to support the creation and exchange of local content in local languages across the South, supported by a range of information and communication technologies (ICTs). It is a network which collects, shares and disseminates local knowledge, considering that local content development is closely tied to human development. Its work focuses on various countries of east, west and southern Africa, India and also in Latin America. All information on their site is in English, French, Portuguese and Spanish.

FAO's Participation Website

http://www.fao.org/participation/

E-mail: IWG-PA-Webbox@fao.org

The Participation Website was established in 1999 by the Informal Working Group on Participatory Approaches and Methods to Support Sustainable Livelihoods and Food Security (IWG-PA). One of the key objectives of the working group is to capitalise on FAO's most successful normative and field experiences with participatory approaches and methods through their adaptation, replication and dissemination, in order to enhance FAO's field programme. The site, with links, news and broad information, is also in French and in Spanish.

PROLINNOVA

http://www.prolinnova.net/

P.O. Box 64, 3830 AB Leusden, The Netherlands
E-mail: prolinnova@etcnl.nl

PROLINNOVA (PROmoting Local INNOVAtion) is an NGO-led initiative to build a global learning network on promoting local innovation in ecologically oriented agriculture and natural resource management. Its focus is on learning from and encouraging field activities that strengthen the capacities of smallholders, livestock-keepers and fisher-folk to adjust to changing conditions; to continue to develop and adapt their own site-appropriate systems and institutions of resource management. Its website includes information on each of the country programmes, news and events, links to other websites and to publications, and even a picture gallery. Visitors are welcome to join their E-mail mailing list.

Seed Initiative

http://www.seedinit.org/

Seed Initiative, c/o IUCN, rue Mauverney 28, CH - 1196 Gland, Switzerland. E-mail: info@seedinit.org

The Seed Initiative ("Supporting Entrepreneurs in Environment and Development") aims to inspire, support and build the capacity of locally-driven entrepreneurial partnerships to contribute to the delivery of the Millennium Development Goals. The initiative focuses on delivering real solutions through project cooperation among all the different actors working in the field of sustainable development. Through an international award scheme, intensive capacity-building activities and a research programme, the Seed Initiative aims to stimulate and build the capacity of entrepreneurial, nascent partnerships; disseminate good practice and lessons-learned; and generate evidence-based research to assist policy makers. Readers with innovative ideas for a partnership project that may contribute to sustainable development are encouraged to apply for the "Seed Awards".

Creating and Exchange of Local Agriculture Content, CELAC

http://www.celac.or.ug/

P.O.Box 26970, Kampala, Uganda. E-mail: brosdi@infocom.co.ug

CELAC is a project of the Busoga Rural Open Source and Development Initiative, aiming at the use of ICT methods and knowledge sharing to enhance poverty reduction and food security. CELAC operates in all the four regions in Uganda, collecting and exchanging local agricultural content that works from the farmers. Their website includes general information, a set of guidelines, specific farmers' advice, and access to their newsletter.

Resources Centres for Participatory Learning and Action, RCPLA Network

http://www.rcpla.org

E-mail: pisaak@neareast.org

The RCPLA network is an alliance of seventeen different organisations from around the world, that strive to promote the empowerment of the disadvantaged through participation in their own development. The Network helps researchers and practitioners share information and experience about Participatory Learning and Action (PLA) approaches, and encourages the improved implementation of these approaches globally. Since its creation, the RCPLA has helped to facilitate the development of PLA ideas. Through the Network, partners have also influenced the development and application of participatory methodologies on local, national, and international levels.

Call for articles

March 2007, Vol. 23.1

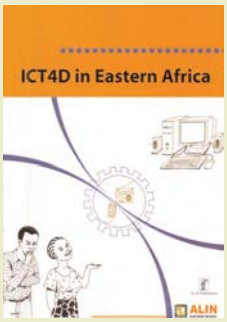
How farmers organise

The development of low external input sustainable agricultural systems benefits greatly from farmers linking up and working together in some way. But farmer organisations take many forms: they can be formal or informal, be very loose or highly structured, and many need to find funding for their activities. In addition, the local socio-political environment may affect how organisations are formed and operate successfully. With this coming issue we want to examine some of the ways in which farmers organise themselves around LEISA concerns, and how these groups are managed to be most effective.

There are many examples of small, local groups which have grown to be part of other regional or national networks – we would like to hear how this happens and what the advantages and difficulties are in each case. Similarly, there are many examples of farmer organisations successfully working with external actors, such as NGOs, research institutions or advisors. Are you part of a farmers group, community based organisation, co-operative, or study group? How did you choose which type of organisation to form, and why did you decide to get together? What organisational practices and policies have been important for achieving objectives? What has working together helped to achieve – individually, as a group or community? We are especially interested in hearing about the many reasons why farmers organise, and the benefits as well as the challenges that working together can bring. Please send us your experiences related to the development and the processes involved in establishing a successful group.

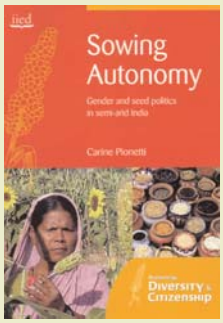
Deadline for submission of articles: 1 December 2006.

NEW BOOKS



ICT4D in Eastern Africa, 2005. 160 p. ISBN 9966 9775 7 0. Arid Lands Information Network - Eastern Africa (ALIN-EA), PO Box 10098, 00100 G.P.O., Nairobi, Kenya. E-mail: info@alin.or.ke ; http://www.alin.or.ke
This book features the work of the Arid Lands Information Network-East Africa and partners in enhancing the process of information exchange among rural communities in Africa. In it, experiences of using and promoting Information and Communication Technologies (ICTs) at community level are documented and shared, demonstrating the impact of ICTs, and providing guidelines on successful implementation of ICTs within communities. The first part of the book describes the new technologies that are applicable in remote areas and among rural communities. The second part consists of five case studies from Uganda, Tanzania and Kenya brought together by participants of a writing workshop. The case studies show that various ICTs can be used to access and disseminate information, and highlight that knowledge is a means of empowering communities to access markets and improve their livelihood options. Although the costs of installing and maintaining communication facilities in remote regions can be high, the benefit of such services far outweighs the costs.

Science, agriculture and the politics of policy: the case of biotechnology in India by Ian Scoones, 2006. 417 p. ISBN 8125029427. Orient Longman, 3-6-752 Himayatnagar, Hyderabad 500 029 (A.P.), India. E-mail: hyd2_orlongo@sancharnet.in
In this book the author examines the intersections of globalisation, technology and politics through a detailed empirically-based examination of agricultural biotechnology in India. The focus is on Bangalore and Karnataka, a part of India which has seen massive growth in biotech enterprises, experimentation with GM cotton and a contested policy debate about the role biotechnology should play in economic development. Through a detailed case study, the aim of the book is to discuss, question and refine the debates, locating an understanding of biotechnology firmly within an understanding of society and politics.



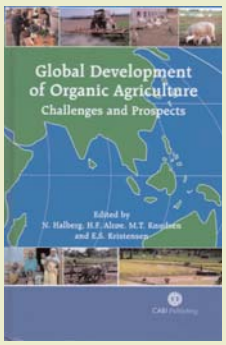
Sowing autonomy: gender and seed politics in semi-arid India by Carine Pionetti, 2005. 240 p. ISBN 1843695626. IIED, Reclaiming diversity and citizenship series, IIED, 3 Endsleigh Street, London WC1H 0DD, U.K. E-mail: info@iied.org ; http://www.iied.org
Through their multiple roles as farmers, livestock herders, cooks, gardeners, keepers of culinary traditions, seed custodians and healers, women play a major role in shaping biodiversity for food and agriculture. Carine Pionetti looks in particular at women's roles in agriculture, more precisely in saving and reproducing seeds in the drylands of the Deccan Plateau, in South India. Detailed farmers' accounts of why seed-saving is essential emphasise the interconnectedness between self-reliance in seed, crop diversity and nutrition. These three areas are largely under the control of women. However, the processes of industrialisation and institutionalisation in the seed sector are undermining independent seed production, and, as such, the position of women. The author argues that a radical reorientation in public policies is needed to support autonomous seed production in the drylands of South India. Poverty alleviation and biodiversity conservation both directly depend on this.

Bullshit A documentary film by PeÅ Holmquist and Suzanne Khardalian, 2005. 73 min. HB PeÅ Holmquist Film, Sweden. http:// www.peaholmquist.com
This film is about Vandana Shiva, Indian environmental activist and nuclear physicist, who was awarded the Right Livelihood Award in 1993. It's a film about globalisation and patenting, genetic engineering, bio-piracy, and indigenous knowledge. In this documentary, the filmmakers follow Vandana Shiva over a two-year period, from her organic farm at the foot of the Himalayas to institutions of power all over the world. Here Vandana Shiva does battle with one of her toughest opponents, Monsanto, a huge American biotech company, when they try to patent an ancient Indian strain of wheat. In this film Vandana Shiva also tackles the question of farmers' suicide, a backlash of the globalisation. Her opponents gave her "The Bullshit Award" for sustaining poverty, yet for many she is a hero of our times, an icon for youngsters all over the world.

Beekeeping in the tropics by Leen van 't Leven, et al., 2005. 86 p. ISBN 9085730430. Agrodok-series No. 32. Agromisa PO Box 41, 6700 AA Wageningen, The Netherlands, E-mail: agromisa@agromisa.org ; cta@cta.int
Downloadable from http://www.agromisa.org, also in French and Portuguese.

Bee products: properties, processing and marketing by Marieke Mutsaers, et al., 2005. 94 p. ISBN 9085730287. Agrodok-series No. 42. Agromisa PO Box 41, 6700 AA Wageningen, The Netherlands. E-mail: agromisa@agromisa.org ; cta@cta.int
Downloadable from http://www.agromisa.org, also in French and Portuguese.
These two revised Agrodoks booklets focus on how to keep honey bees as a source of income. They provide practical information on beekeeping with few resources and on producing bee products that meet market demands.

Global development of organic agriculture: challenges and prospects by N. Halberg et al., (eds.), 2006. 377 p. ISBN 1845930789. CAB International, CABI Publishing, Wallingford, Oxfordshire OX10 8DE, UK. E-mail: cabi@cabi.org ; http://www.cabi-publishing.org
The main aim of this book is to provide an overview of the potential role of organic agriculture in a global perspective. It provides in-depth discussions on political ecology, ecological justice, ecological economics and free trade, with new insights on the challenges for organic agriculture. These are followed by coverage of the potential role of organic agriculture in improving soil fertility, nutrient cycling and food security and reducing the use of veterinary medicines, together with discussions of research needs and the importance of non-certified organic agriculture. This book will be of interest to researchers in organic agriculture, agricultural economics and rural development as well as NGO workers and policy makers.



Chain of innovations

Hailu Araya and Sue Edwards

In 1996, the Institute for Sustainable Development (ISD) and the Bureau of Agriculture started working with 45 farming families in Adi Nifas – a highly degraded semi-arid area in Tigray, in northern Ethiopia. The aim was to find out if rehabilitating the environment and introducing compost could increase the productivity of the land and improve the livelihoods of the farmers. However, before the farmers were prepared to try making compost, they asked for help to stop two gullies that were eating away their fields. The community built check dams and planted the gullies with trees and grasses. In two years, the gullies were stopped and standing water appeared.

This success stimulated a farmer living next to the project community, Woldu GebreWahid, to rehabilitate his land. Woldu inherited a quarter of a hectare of land near to his house, and lives there with his wife, Hawariya and three children. It was poor land for farming: very steep, infertile and cut by a gully over 2m deep and wide.

How he started

In 1998, Woldu saw the improvements in Adi Nifas and started to build check-dams and plant trees in the gully cutting his land. He also dug pits to catch both soil and water to rebuild his fields. Many of his neighbours thought he was crazy. But the change he made is unbelievable. By 2001, he had rebuilt his fields. "I learned two things from the project in Adi Nefas: that gullies and erosion can be stopped by check-dams and vegetation cover; and that compost can increase agricultural yield and soil fertility. Previously, I could not plough my land with my oxen because it was in two slices (i.e. divided by the gully), so I was digging my land by hand. I was annoyed I could not work with my oxen like others. But after catching the soil, I rebuilt my fields and could plough with my oxen. I was called 'an innovator' by the local agriculture experts."

Finding permanent water

His second plan was to find a permanent source of water. He said: "I remember *Qeshi* (Priest) Malede, a local innovator, saying that there is water in this land but the question is where to find it. I chose a place where the flood passes through; I thought it may be a place where water is retained. I dug for two metres and saw there was moist soil. When I got deeper I got better moist soil. At last I found water at around six metres. I remember I cried because I was excited."

After he found water, he built a well and planted fruit trees. He pulled water directly from his well, but "it was not good for my wife and children because they could fall into the well. So I started to search for new techniques. ISD helped me and my wife to visit *Qeshi* Malede." This was in 2003. *Qeshi* Malede had designed and built a lifting device using a long pole with a weight at one end, so that his wife could lift the water container easily. In the week after the visit, Woldu built his own device for lifting water from his well. He took a piece of heavy metal from a military tank destroyed in the fighting of 1990-91 to use as the weight on the end of a long eucalyptus pole. But watering was still tedious. Therefore, he bought a barrel for holding water and took the water to the plants through a plastic tube. He then replaced the barrel by a one-metre cube cemented tank. His wife and children now do most of the watering.

Photo: Sue Edwards

Woldu's neighbours were interested to see his experiments with water-lifting devices.

From carrying by hand to a modified drip system

He and his wife then experimented to find the best way of watering. He brought orange trees from a nearby nursery and planted them at the same time. He tried a different treatment on each orange tree:

1. *Direct pouring of water*: many farmers build 50 to 100 cm diameter basins around their trees and water them in the morning or in the evening. Woldu found that the water was gone in half an hour and the soil dried up in two hours. The orange trees were also affected by ants and termites.
2. *Traditional drip irrigation*: a gourd is hung on each orange tree. It has a hole at the base plugged with cotton cloth so the water leaks out slowly. It is filled with water in the morning or in the evening. Woldu found that the volume of water reduced fast and it became warm, particularly during the day. The advantage of the gourd drip system is that it can be prepared easily and it protects the trees from ants and termites - when water drops on the tree stem and leaves, ants and termites are deterred from visiting the plants.
3. The *"buried pot system"*: an old clay pot that has cracked or has a hole made in it is buried under each tree. The hole is plugged with cotton cloth, and filled with water. The water stays longer than in the other treatments, stays cool and reaches the root parts continuously. This method also protects the trees from termites.

Where is Woldu and his family now?

Woldu comments: "My family and neighbours now respect me. Now I am often the first to be visited and invited by officials and experts to meetings. Farmers come and share their ideas in my place. Moreover, I see fruits and vegetables in my garden; my wife sells in the market and the family, especially my children, eat well. Now we have five cattle and three goats. We feed them at home. They are fat and better looking than other peoples' animals." ■

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