

Bridging the gaps between researchers' and farmers' realities

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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



Farmers identified a number of desirable traits in maize.

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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