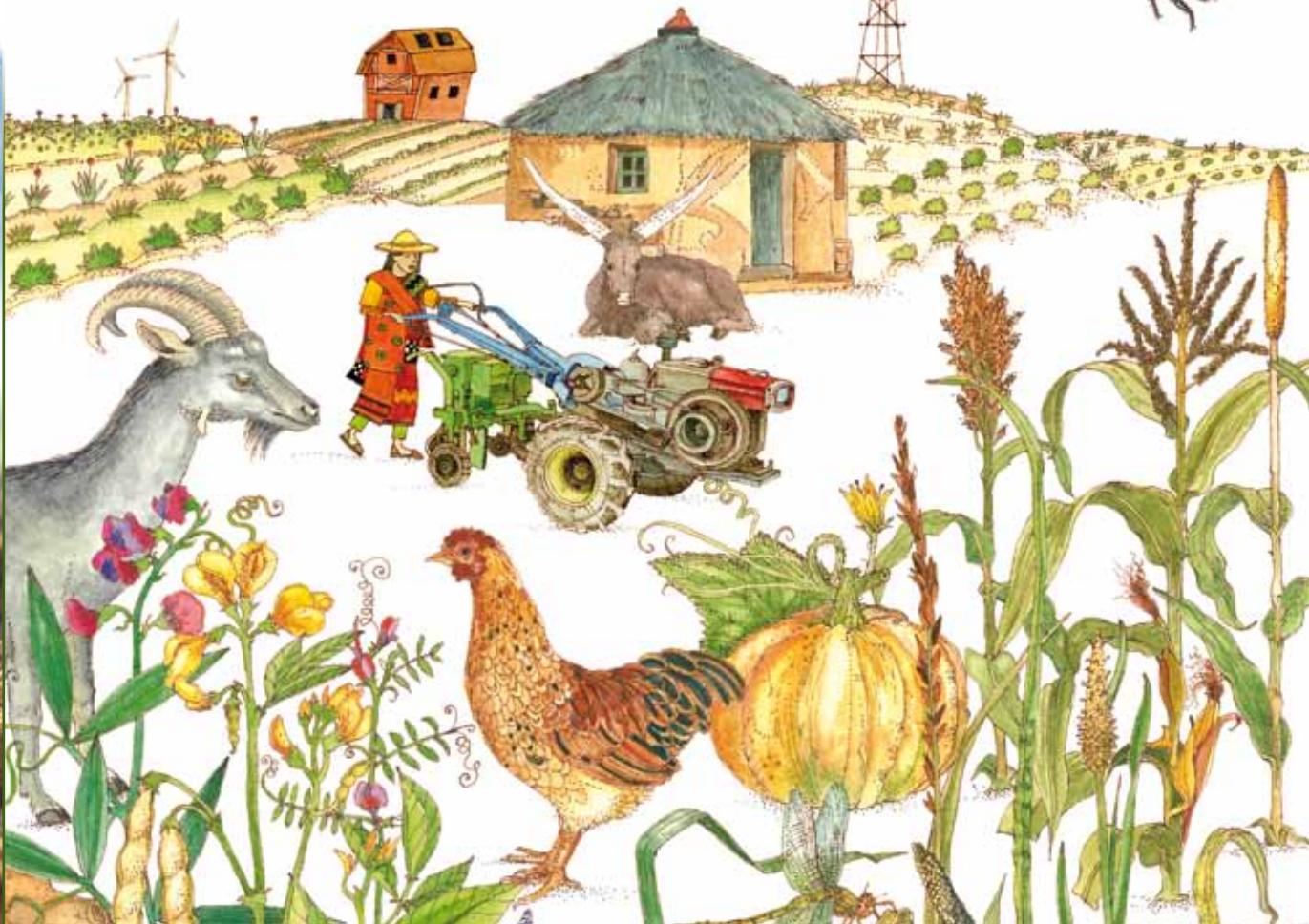




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CASE STUDIES

Agroecology in Practice





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LEARNING AND INNOVATING TOGETHER: A PARTNERSHIP BETWEEN FARMERS, SCIENTISTS, PUBLIC AND PRIVATE ORGANIZATIONS

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Abstract

Unlike the top-down approach of conventional research, participatory research methods offer a bottom-up approach, involving all major stakeholders from the beginning of a research project. Integration of the end users of research (i.e. farmers) enhances the acceptance and adoption of innovations, along with making the best use of the local knowledge that is available. The Research Institute of Organic Agriculture (FiBL), Switzerland – one of the world's leading institutions in the field of organic agricultural research – participates in numerous international projects, involving research, consultancy, training and development cooperation. With the objective of providing sound scientific information by comparative analysis of various agricultural management systems (e.g. conventional, organic, biodynamic), FiBL initiated a long-term research programme in 2007, called the Farming Systems Comparison in the Tropics (SysCom). Participatory On-farm Research (POR) is a strong component of the SysCom programme, along with Long Term Experiments (LTEs) running on four research sites across three tropical countries (Kenya, India and Bolivia).

POR involves the active participation of various stakeholders, including local farmers, extension workers, trade/industry partners and researchers, in problem identification, exploration of possible solutions and testing of the

proposed innovations. Experiments are conducted on both research farms (mother trials) and farmers' fields (baby trials). Effective use of local knowledge and locally available resources is a priority in our POR work. Our participatory research activities on homemade organic pesticides and enhancing phosphorus availability have shown remarkable success. We have developed a methodology to produce compost enriched with acidulate rock phosphate (RP) using locally available materials and have standardized the methodologies for preparation of various botanical pesticides. To address the strong demand for organic cottonseed, we started participatory breeding activities that have developed into a large-scale breeding project (Green Cotton Project).

In addition to the local farmers, we work in participation with an industrial partner (bioRe India) in Madhya Pradesh state, India; bioRe ensures the supply of inputs and procurement/marketing of organic cotton produced by the local farmers. The SysCom programme is financially supported by a coordination committee of donors comprised of various public and private funding bodies. Backstopping by a well-qualified scientific advisory board ensures that the research conducted in SysCom meets international standards. This case study describes the success of this partnership between farmers, researchers, public and private institutions.



FIBL SWITZERLAND

FiBL is one of the world's leading institutions in the field of organic agriculture research and consultancy. FiBL's strengths include closely linked interdisciplinary research and the rapid transfer of knowledge from research, to extension, to agricultural practice. Committed to the international development of organic agriculture, FiBL works closely with the International Federation of Organic Agriculture Movements (IFOAM) and other international organizations. Along with its expertise in farming practices, organic soil management, plant production, holistic animal health, animal ethology, animal breeding, socio-economics, comprehensive analysis of the organic market, organic food processing and production, FiBL places a high priority on knowledge transfer into agricultural practice. This is achieved through FiBL's advisory work, training courses and expert reports, including dissemination through magazines, the monthly journal *bioaktuell*, technical leaflets, reference books, videos and internet material. As FiBL's competence in organic agriculture is sought after globally, it is involved in numerous international projects, including research, consultancy, training and development cooperation.

THE SYSCOM PROGRAMME

A net increase in global food availability was achieved during the last century by intensification of agricultural production using energy-intensive conventional agricultural practices (Trewavas, 2002; Tscharntke *et al.*, 2005). This development has been accompanied by deteriorating natural resources, caused by inefficient use of fertilizers, pesticides and fossil energy (Pimentel, 1996; Singh, 2000; Rigby and Cáceres, 2001; Badgley *et al.*, 2007). Continuing with the same approach would be unsustainable. A more system-oriented approach like organic agriculture is preferable because it builds on the efficient use of available resources and the use of locally adapted technologies. The system-oriented approach is particularly promising in risk-prone tropical ecosystems with burgeoning populations. However, organic agriculture has been criticized as not being capable of 'feeding the world', as well as for its low labour productivity and high production risks (Kirchmann *et al.*, 2008; Seufert *et al.*, 2012). The advantages of organic farming systems in terms of resource efficiency, ecosystem functioning, soil fertility conservation and economic impact have been proven in a wide range of studies conducted under temperate environments mainly in industrialized countries (Offermann and Nieberg, 2000; Stolze *et al.*, 2000; Maeder *et al.*, 2002; Pimentel *et al.*, 2005). In recent years, organic agriculture has also gained ground in developing countries, although the experimental evidence on its comparative advantages under tropical conditions is rather limited. With the objective of establishing a scientific basis for discussions on the performance and potential of organic agriculture compared with conventional production systems in the tropics, FiBL is running the long-term SysCom programme to compare farming systems in Kenya, India and Bolivia. The programme is based on LTEs that capture and monitor the effects of contextual changes over time, together with the POR approach that aims to develop technological innovations and management practices adapted to local farmers' conditions.



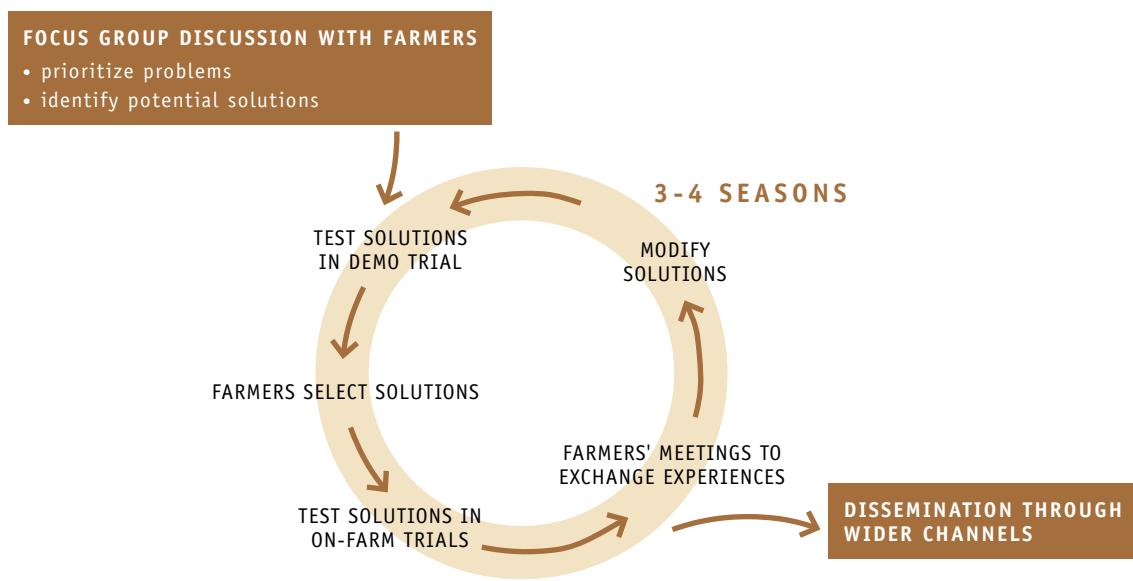
Started in 2007, the SysCom programme is coordinated by FiBL, with the project activities in the partner countries being implemented by local institutions. The International Centre of Insect Physiology and Ecology (ICIPE), bioRe Association and Ecotop are the main local partners in Kenya, India and Bolivia, respectively. In Kenya, the conventional and organic treatments are applied at two input levels in a three-year (six-season) crop rotation with maize, beans, vegetables and potatoes at two field sites. In Bolivia, conventional and organic cacao production systems are being studied in monoculture (full sun) and agroforestry (shaded) systems. In India, the trial compares organic, biodynamic, conventional and genetically modified Bt cotton farming systems in a two-year crop rotation with cotton, soybean and wheat as the main crops.

PARTICIPATORY ON-FARM RESEARCH

An important component of the SysCom programme is the use of the POR approach to develop locally adapted solutions for the most critical production challenges faced by the farmers. POR involves active participation of various stakeholders – particularly the farmers as end users of research – throughout the process of innovation development. We make use of an innovation cycle that includes the key steps of problem identification, exploration of possible solutions and testing of the proposed innovations (Figure 1). Focus group discussions, farmers' meetings and field visits help to prioritize problems and to identify potential solutions, thereby making effective use of local knowledge and locally available resources.

A 'mother-baby' trial concept is used to conduct field experiments on research farms (mother trials) as well as on farmers' fields (baby trials). 'Mother trials' are set up to test the potential solutions that have been identified within a scientific environment. 'Baby trials', on the other

Figure 1. Innovation cycle used in Participatory On-farm Research





hand, are conducted on the fields of local farmers to test these innovations under actual farm conditions, which present more realistic circumstances. While on-farm trials are conducted by the farmers themselves under the guidance of research staff, farmers also participate in each stage of experimentation from set-up to evaluation of the on-farm trials. The POR approach offers farmers an opportunity to gain experience in critical evaluation of new technologies and in overcoming the challenges of implementation by further adapting technologies to suit their particular requirements. If it becomes apparent that farmers need to know more in order to experiment by themselves, tailor-made trainings are offered.

INVOLVEMENT OF STAKEHOLDERS

Besides local farmers, the active participation of various stakeholders, including researchers, extension workers, trade/industry partners and public institutions is a characteristic feature of the SysCom programme. The advantage of this structural arrangement is particularly evident in the case of India, where the project is set up in close collaboration with bioRe Association and bioRe India Ltd in Madhya Pradesh state (Figure 2). The bioRe Association is a farmers' body undertaking activities of social importance, such as the provision of health care and education in rural areas of Madhya Pradesh. The research division of bioRe Association aims to provide local solutions for sustainable agricultural production with a main focus on cotton, which is the most important cash crop in the region. The raw organic cotton is procured by bioRe India Ltd and processed for export to the international market. Besides maintaining a strict quality control, provisioning of seeds and inputs, and organizing the certification for organic farmers, bioRe's extension and training team also supports the farmers in obtaining optimal production of their organically cultivated cotton. Remei AG, one of the most important trade partners of bioRe, produces organic textiles for the Naturaline brand of Coop, which is a significant retailer in the Swiss market. With this arrangement, bioRe offers secure access to the global market for organic smallholder farmers. Furthermore, Coop is a significant donor to the research and development projects run by the bioRe Association. Along with continued support from the Swiss Agency for Development and Cooperation (SDC), Liechtenstein Development Service (LED) and Biovision Foundation, the Coop Sustainability Fund financed the SysCom programme until 2014. From 2015 onwards, the Coop Sustainability Fund is supporting research activities in India by means of a new project entitled long-term sustainability of organic cotton production in India, which is closely associated with SysCom. This is an exemplary model of the integration of research within agri-value chains, and will be published in the forthcoming FAO handbook on *Developing sustainable food value chains*.

In this research cooperation, the basic project management and research activities are conducted by the bioRe research staff under the supervision of FiBL researchers. In addition, core research activities are being carried out in collaboration with various universities and public research institutions. For example, Ph.D. and Master's thesis projects are being carried out in collaboration with Govt. Holkar Science College, Indore, the Swiss Federal Institute of Technology (ETH), Zurich, and the University of Hohenheim. Moreover, a number of Bachelor student projects have been undertaken in collaboration with the School of Agricultural, Forest



and Food Sciences, Switzerland, the Zurich University of Applied Sciences and other academic institutions in Europe. A Scientific Advisory Board (SAB) comprised of internationally renowned agricultural scientists backstops the research work being conducted in the SysCom programme, ensuring that high standards are maintained.

ACHIEVEMENTS IN POR

Using the participatory approach, two major challenges facing organic cotton farmers were identified: crop nutrition and pest control. In the brainstorming sessions we also explored various opportunities to overcome these challenges using local materials. To improve the nutrient supply for organic crop production, two lines of action were implemented in parallel: (i) improving farmyard manure management; and (ii) efficient use of RP on high pH soils. For the first line of action, a locally adapted compost making process was standardized in partnership with the farmers. For the second line of action, we tested a number of local products to acidulate RP to enhance the availability of phosphorus in organic agriculture. Experiments conducted on the bioRe research farm revealed that butter milk was the best locally available material for acidulation of RP. Subsequently, the two lines of action were combined together by incorporating the acidulated RP into well-prepared compost. Field trials were conducted on the research station as well as farmers' fields using the mother-baby trial concept, which led to the standardization of the methodology for RP enriched compost. To enhance the motivation and participation of local farmers in this project, a competition was run during 2013. Every farmer exhibited excellent commitment and participation; the farmer who produced the best manure using the standardized methodology was awarded a cow and a calf, while others also received consolation prizes. Further agronomic trials are being conducted on farmers' fields to quantify the effect of the methodology on the yield and quality of various crops.

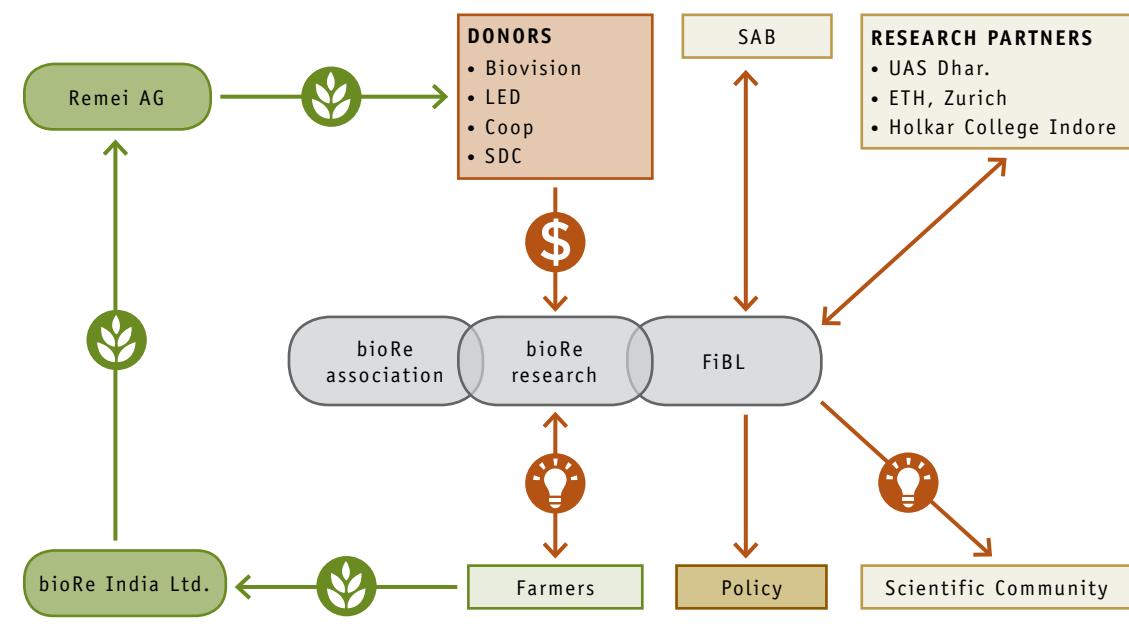
In a similar manner, making the best use of available local knowledge, we have standardized the preparation methodologies of various botanical pesticides. These formulations and their dosages are being tested against specific pests (e.g. cotton bollworm, cutworms and sucking pests). Due to organic farmers' urgent need for high-quality cottonseed in India, POR trials with cotton cultivars started in 2010 and have since become a prominent national issue. This preliminary research resulted in the development of the Green Cotton Project, a large-scale associate project on participatory cotton cultivar evaluation and breeding, aiming for locally-adapted cultivars and seed sovereignty (Messmer *et al.*, 2013), in collaboration with NGOs, private and public institutions.

DISSEMINATION AND EXTENSION

The combination of the POR and LTE methods has proven successful in offering a suitable platform to provide practical solutions to the farming community. LTEs serve as important focal points for information and discussions on sustainable agricultural practices, attracting



Figure 2. Involvement of various stakeholders in the research process



hundreds of visitors every year, including farmers, extension workers and researchers. The direct involvement of farmers and other stakeholders in the POR approach helps in two ways. First, it ensures the success of the developed technology by already considering the interests of farmers from the beginning of the process. Second, through the participation of farmers, the newly developed technology is effectively disseminated by word of mouth.

In parallel, farmers and extension workers are being trained in pest-monitoring strategies. We have developed a number of leaflets and brochures to be used by farmers and extension workers, which are available to download for free on our website (www.systems-comparison.fibl.org/en/scp-publications/leaflets-brochures.html). In addition, the SysCom programme has made significant contributions towards capacity building by training project staff, 19 B.Sc. and M.Sc. students, six Ph.D. students and several interns in the three countries. For dissemination of the research results, three peer reviewed articles have been published in scientific journals, together with 45 conference contributions, and 30 international and national media releases and radio broadcasts.

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AGROECOLOGY is the science of applying ecological concepts and principles to the design and management of sustainable food systems.* It focuses on the interactions between plants, animals, humans and the environment. Agroecological practices work in harmony with these interactions, applying innovative solutions that harness and conserve biodiversity. Agroecology is practised in all corners of the world, with the traditional and local knowledge of family farmers at its core. Through an integrative approach, agroecology is a realm where science, practice and social movements converge to seek a transition to sustainable food systems, built upon the foundations of equity, participation and justice.



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