

Saving the world's plant species has been a concern ever since botanical gardens were

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Abstract Saving the world's plant species has been a concern ever since botanical gardens were introduced. Concerted efforts to preserve and manage genetic resources have taken up steam since the seventies of the last century through the Consultative Group on International Agricultural Research (CGIAR) and through various gene banks. Agricultural biodiversity is a special concern within this broader objective of conservation. Providing access to wild varieties of crops currently in use in farming has an added urgency to enable further development of crops to ensure food production and food security. However, preservation of species in gene banks and botanical gardens does

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have even less incentive, as they tend to be dependent on crops for their own subsistence.

The focus on biodiversity in farming gradually became labelled as "agro-biodiversity". This term was not universally used and no universally accepted definition exists yet. However, in the last two decades the efforts to ensure or promote biodiversity in farming have increased and there is an increasing number of definitions floating around and being discussed. For the purpose of this article I will use the definition as proposed by the Food and Agriculture Organization of the United Nations [6], which includes the variety of animals, plants and micro-organisms, as well as species that support production (soil micro-organisms, predators, pollinators) and the wider environment that supports agro-ecosystems.

Multilateral agreement on the need for action dates from 1996, when the Convention on Biological Diversity decided to adopt a programme of work on agricultural diversity at the third Convention of Parties (COP) in Nairobi [3]. The tension between the different goals of agriculture and biodiversity conservation is highlighted in the work program with its dual objectives to "promote the positive effects" of agricultural production on biodiversity but also "mitigate the negative effects". A follow-up decision at COP 9 [4] confirms the central role that FAO had started to play in gathering and analyzing data on biodiversity in agriculture.

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A rich literature exists of research into agricultural biodiversity and several research consortia are active on this topic. Many of the approaches aim to integrate a farming systems perspective into the research, focusing on questions like the role that biodiversity plays in agriculture. An overview can be found in the International Farming Systems Collection, hosted by the University of Florida (<http://ufdc.ufl.edu/?s=ifsa>). An overview of research on agricultural biodiversity has been given by Altieri and Rogé [1] and “agroecology-based agricultural production”, which focuses on combining restoring local self-reliance with conserving and regenerating natural resources, has recently been highlighted by Altieri and Toledo [2].

Agro-biodiversity has also received increased attention in project interventions of international donor institutions like the Global Environment Facility (GEF), often integrated into other objectives for which the GEF has an international mandate, like land degradation. The Desert Margins Project is an interesting example (GEF projects 1242 and 2344; see the database of the GEF at The UN Environment Programme man-aged the project, which was executed through an impressive collaboration between nine countries, their agricultural research institutions, five centres of the CGIAR and many international and national research institutes. Each country involved between 10 and 15 research partners in the activities in that country.

The focus of the programme was participatory work with small farmers and land users to improve farming practices and ensure more sustainable resource management in the desert margins. The regional nature of the project and the involvement of research institutions was aimed at bringing better practices and newly developed varieties from country to country, and from the CGIAR into the field. Biodiversity loss was identified as one of the prime causers of land degradation. Introducing new crops in small holder agriculture was one of the aims to re-introduce biological diversity in farming practices.

The desert margins in the nine countries (Botswana, Burkina Faso, Kenya, Mali, Namibia, Niger, Senegal, South Africa, and Zimbabwe) differ in climate characteristics, populations, farming practices, soil characteristics, water availability and so on. What seemed to be uniform turns out to be quite different, and as a result the project had great difficulty establishing common factors, identifying common solutions and aggregating findings into higher level insights. Almost inevitably the gains that were made turned out to be local in kind, rather than national or regional.

In 2007, I had the opportunity to see this in person in the area of Machakos in the South of Kenya, where I visited three farmers who had collaborated with the project for 3 years. The project provided them with new varieties of

crops, with advice on agricultural practices focusing mainly on multi-cropping, ensuring better water capture, animal husbandry and on use of agricultural products that were considered to be waste. The three small holder farmers experimented with the new crops and the new practices and decided which to follow and which to abandon. The support was given by a research team of the Kenyan Agricultural Research Institute and visiting scientists from CGIAR institutions. The crop varieties and practices introduced had several aims: to increase productivity, to bring back species that had been lost in unsustainable agricultural practices and to bring ideas from other countries that had been proven to work there.

It was clear that improvements were relatively small: a plot of land here, a new variety of trees with better fruits there, some shading that allowed higher productivity, an abandoned experiment there, some water shed arrangements, some changes in food for the animals, and so on. The research team that was present during my visit was proud of the achievements of the farmers. They carefully kept track of the changes in biodiversity and the resulting impact on land degradation in the area, and they encouraged the farmers to engage with their neighbours to replicate successful new practices.

The farmers themselves were very open about the success of the new practices. All three felt that their income had increased due to better (and more) products that they could bring to local markets. This was visible on the farms: some had recent extensions built to the house in which the family lived—a new water tank and other agricultural equipment was visible. Other benefits were less easy to verify in a short visit: one of them told me they could now send their children to school. It was clear that higher incomes and social benefits were essential elements to convince other farmers to adopt the new varieties and practices. The research team had introduced monitoring of agricultural practices to the farmers—precise notes were made on what was planted and how much was harvested. I asked whether they also had kept track of the economic and social aspects, and they confessed that they did not.

At the end of its second phase, the Desert Margins Project was evaluated [5]. The difficulties were confirmed in bringing together so many different countries, local farming practices, institutions, variability in climate, soils and so on. In this diversity it was extremely difficult to streamline objectives, outcomes, outputs, targets and results—and the report noted a whole series of confusions, contradictions and complications on these within the project. Notwithstanding successes that were achieved in different locales, the overall rating for the outcome of the project was *moderately unsatisfactory*.

The GEF Evaluation Office (GEFEO) reviews all terminal evaluations and in this case decided to downgrade

the rating of outcome achievement from *moderately unsatisfactory* to full *unsatisfactory*, as the lack of achievement on the goals and ambitions of the project justified this [7]. The *unsatisfactory* judgment meant a disjuncture between my own observations near Machakos and the general verdict of the outcome of the regional project. Could it be that the unsatisfactory overall achievement more or less pulled a veil over promising achievements with local small holders?

GEFEO also verifies both terminal evaluations and its own reviews through field visits. The second phase of the Desert Margin Project was selected for field verification through a random selection process. The verification took place in 2008. It resulted in a return to the original verdict of *moderately unsatisfactory* [8]. The verification report noted: “Even though the project (...) did not gather and assess information that would help in performance based identification of technologies that could be up scaled, many promoted technologies (...) have been adopted by the target groups implicitly suggesting that these technologies are likely to be locally well suited [8].” The local achievements were recognized in the review and thus confirmed my impressions during my visit to Kenya in 2007.

The story of this project shows the particular challenge of bringing together agricultural production, food security, poverty alleviation, gender issues and biodiversity and land degradation concerns. In situ conservation requires an ecosystem, habitat, landscape or integrated resources management perspective that is by definition multi-disciplinary and holistic—at least in the sense that it needs to integrate biophysical considerations with economic and social ones.

My experience in Machakos had been uplifting, optimistic and promising: in the three farms I visited I saw collaboration between international research, national research and farmers in a more or less equal relationship, with farmers willing to experiment with new crops and practices, provided they were handed over free of charge, and researchers willing to think through what could work under local conditions, given their rich knowledge of crop research, and a willingness to exchange farming practices from country to country. One of the researchers in Machakos was from West Africa and he told me he was surprised that some uses of agricultural products (mainly tree leaves) that he was familiar with in West Africa turned out to be unknown in East Africa.

India is a continent in its own right, with the same wide range of local circumstances that can be witnessed in Africa. In situ conservation of biodiversity in India faces many of the same challenges, especially for small holders. Conservation of biodiversity as an element of farming practices shows great promise. The recent reviews on conservation achievements at different scales show that micro level achievements are possible [9] and that small holder farmers can play an important role [2]. My hope is that this new publication may rise to the challenge and devote sufficient space to multidisciplinary findings of research in India on agricultural biodiversity and its linkages to land degradation, ecosystem services, incomes of marginal farmers and social development of farming communities—all in the light of achieving higher level goals of sustainable agriculture and sustainable management of ecosystems, so that they can continue to deliver their services of air, water and food to humankind.

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