Sharing knowledge on agrodiversity for conservation and livelihood improvement

Supporters of small-scale farming claim that it provides livelihoods, and it can also conserve agrodiversity. In an attempt to show this, an international network of scientists joined hands with farmer communities to document agrodiversity. By sharing this knowledge with other farming communities, they showed how it is possible to achieve the twin goals of biodiversity conservation and improving local livelihoods.

Luohui Liang and **Harold Brookfield**

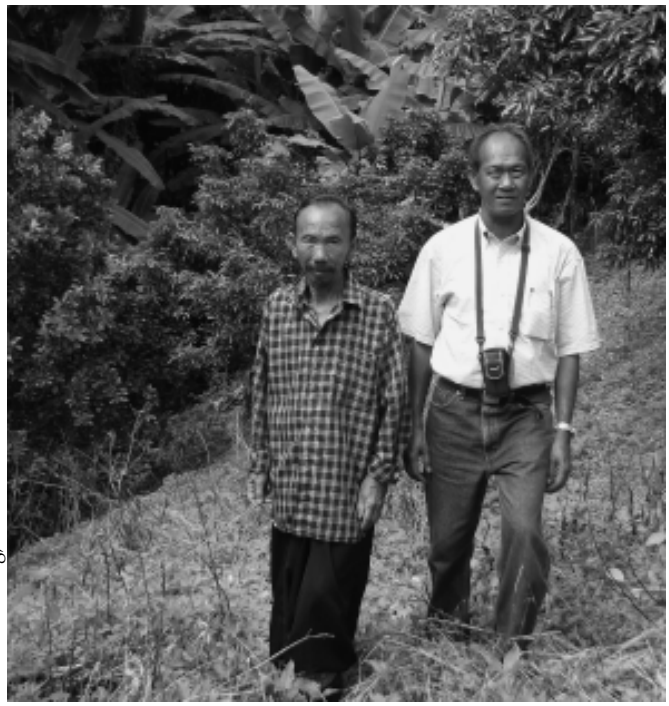

Photo: L. Liang, PLEC

Farmer meets scientist. People from different walks of life got to know each other while studying specialised local knowledge and crops.

Agricultural systems are a dynamic patchwork of different land uses such as annual cropping, orchards, agroforests, fallows, or home gardens. They are home to a great diversity of plant species and genetic varieties. Such systems are threatened by widely promoted monocultural practices of "conventional agriculture". Many organisations have been defending agrodiversity for decades now, supporting the 1.6 billion or so small farmers who experiment with their old practices to keep them alive. You cannot conserve agrodiversity by throwing up a fence around an area to keep "modern" ways out. You have to encourage farmers to keep practising and developing farming.

The "new ecology" in the 1980s held the view that biodiversity can be sustained in agricultural landscapes. Few ecosystems are in balance, and some disturbance to these systems may best promote biodiversity. Farmers' management may be just such a positive disturbance that can sustain biodiversity. This article explains how a global network of researchers showed that small-scale agriculture, besides providing livelihood to farmers, indeed "produces" biodiversity as well. The project tried to figure out how farmers could be supported to sustain such diversity well into the 21st century.

Farmers and scientists work together

Since the early 1990s, the United Nations University (UNU) project on People, Land Management and Environmental Change

Examples of how farmers all over the world maintain diversity

In **Tanzania**, an expert farmer conserved a woodlot with the greatest diversity of trees, shrubs and grasses in the whole community. Most of the trees are natural but some were collected from other places to enrich the economic and social values of the woodlot. Some of the added tree species were among those considered by the farmer to be endangered due to excessive use. Through farmer field days and meetings, he was able to convince some of his neighbours (including those who had been stealing from his woodlot) to plant and conserve their own woodlots. The woodlot also serves as an example for the community to prepare and plant tree seedlings on degraded land.

The team in **Brazil** encouraged community actions for establishing lake and forest reserves with over-exploited or rare wildlife, birds and plant species. Expert farmers there taught others about enriching fallow stages. For example, farmers made small openings in their fallows for planting semi-perennial species such as bananas, and for transplanting seedlings of desirable species.

In a site with yam, the cluster in **Papua New Guinea** organised a field day to show farmers the richness of yam diversity in their possession. More than 30 cultivars of *Dioscorea esculenta* and 20 cultivars of *Dioscorea alata* were displayed. A number of very large *D. esculenta* tubers were arranged in a container like in customary exchanges.

Photo: L. Liang, PLEC

Edge management received particular attention. One expert farmer in **Thailand** made more money through different crops cultivated in field edges, than from monoculture of cabbage or lychee. He also maintained medicinal herbs, wild vegetables and fruits on the edge of the agroforest. In the Fouta Djallon of Guinea, dead wood fences consume scarce wood and require much labour to repair. Using local examples, PLEC-Guinea demonstrated techniques for using live fences as an agroforest edge. In addition to saving wood and labour, live fences provide firewood, construction wood, fruit, medicines, mulch, or fodder. They also have ecological uses such as wind-breaks, soil fertility improvement, shelter for small wildlife; all with conservation value.

On the integration of plants and animals in a seasonally flooded habitat, PLEC-**Peru** identified tree species that produce fruits, which several fish species feed on and disperse, helping to restore part of the tree cover. These efforts demonstrated a way to achieve complementary integration of plants and animals in an agricultural system.

(PLEC), has been developing models of biodiversity conservation in agricultural systems in developing countries. PLEC operated through a global network of groups in Africa (Ghana, Guinea, Kenya, Tanzania, Uganda), Asia-Pacific (China, Thailand, Papua New Guinea), and Latin America (Brazil, Jamaica, Peru, Mexico). Scientists from Australia, United States, Britain, and Japan also participated. Each cluster was multidisciplinary, involving different institutions. UNU and the United Nations Environment Programme (UNEP) jointly implemented the programme.

Although farmers' practices may be broadly similar over quite wide areas, there are always differences in detail. These can include differences between the practices of richer and poorer households, households of different ages and gender composition, and sometimes between whole communities or sub-communities. Other differences arise between the better skilled and the run-of-the-mill farmers. Agrodiversity can therefore never be understood except at a local level, through long-term observation and familiarity with the farming people. To research such diversity, PLEC created groups ("clusters") of scientists working in close contact with the farmers of quite small areas, usually one or two villages. The scientists had to become familiar with the farming systems, and the variation within them. They identified "expert farmers", those who farmed better, conserved better, and often made more profit than their neighbours. Site selection was based on regional biodiversity importance, threats to biodiversity and ecosystems, known examples of agrodiversity, existing partnerships with communities, and availability of historical information. Some sites chosen were those where project members had worked before. They developed into demonstration sites where farmers could show their skilled management.

Identifying agrodiversity research sites

It took quite a while to understand how demonstration sites should be set up. Before early 1999 some clusters carried out reconnaissance work along large transects, extending over many kilometres and several agro-ecological zones. This made it difficult for scientists to develop genuine coalitions with farmers, and other local stakeholders on the ground. In some sites, scientists developed closer links to farmers, and such sites became gradually hotspots of exchanges between scientists, farmers, local communities and other interested people. Basic guidelines for data collection were developed in 1998.

All sites chosen were in agricultural areas with significant biodiversity, often close to parks or reserves. Two of the three sites in China were next to state natural reserves. Several others were close to natural areas reserved by custom rather than law. The first site developed in Ghana was set up at the invitation of a chief who sought help in protecting a sacred grove. Twenty-seven demonstration sites eventually became operational in areas of international biodiversity importance or near "biodiversity hotspots". As demonstration sites, people from much wider areas could see them. The more energetic research groups organised publicity for the sites and their work.

Generally, surveys were made at each site to identify the different land use stages, and within them, field and fallow types. Scientists then sampled households and plots. Farmers showed plant species and management practices on the sampled plots and household economy, which scientists recorded for analysis. With this information, PLEC clusters could compare between land use stages and among households and communities, to discover expert farmers and understand their expertise. Biodiversity was also assessed at this stage. Thus, the project could show that farmers are not destroyers of biodiversity but rather conservers. For example, in Mazagão, Brazil, farmer-managed fallows were more diverse than abandoned fallows. The PLEC teams then figured out what practices and incentives led to this increase of diversity in the farmer's fallow, and whether this enrichment would also lead to an increase in biodiversity at a landscape and regional level.

Sharing farmers knowledge

The next step was to promote expert farmers' technologies and knowledge. Farmers often obtain new ideas and technologies through exchanges with other farmers, and observation. They prefer to see concrete results. Therefore, the expert farmers demonstrated

In **China**, an expert farmer experimented with domesticating a rare and locally preferred timber species found in the forest, *Phoebe puwenensis*. Within two years he had succeeded in growing viable seedlings (not known to plant breeders). He then converted 0.13 ha of sloping land into a tree plantation, which generates income and conserves soil. Through PLEC-China he helped another 95 farmers in his village to adopt the same technology. This activity helped to enrich the monoculture plantation of *Cunninghamia lanceolata* which had been promoted by the government extension system. It also reduced the potential threat of illegal logging of *Phoebe puwenensis* in the natural reserve near the village.

One group of women farmers in **Ghana** compared the characteristics of 12 indigenous varieties of African rice, *Oryza glaberrima*. In contrast, male farmers had switched to "improved" rice and had largely forgotten even the names of indigenous varieties. On-farm trials showed that two of the indigenous varieties had high yield potential and compared well with the introduced varieties. Some indigenous varieties had properties that women prefer, such as being a good baby food, cooking easily, and keeping well overnight. As the normal seed exchange system does not provide enough of the indigenous varieties, the womens' group was encouraged to set up a community seed plot. In this way they could multiply seed of the indigenous varieties they prefer. They also worked to improve storage facilities.

Photo: L. Liang, PLEC

Moko disease has largely destroyed the banana monoculture of Amapá, **Brazil**. Local expert farmers experimented and learned that leaving some *Heliconia* spp. (and other understory species) scattered among bananas trees, could mitigate the Moko disease. This is called the banana *emcapoeirada* agroforest system, which they taught to others. This system is helping farmers regain profitable banana production by managing the Moko disease, increasing biodiversity and also adding a number of products from plant species other than banana.

On inter-species diversity, the team in **Guinea** worked with village women on the revival of an ancient trade of dyeing cotton cloth with local plants of the *Fabaceae* family. For the women, this became an activity with a significant income. Because of increased pressure on the trees, assistance in planting the principal species used in dyeing became a part of PLEC demonstration activity, and the women started growing cotton.

their practices to fellow farmers and extension staff. The elements of diversity management were broad. Farmers explained about diversity within species, between species, at landscape levels, about the associated diversity for soil fertility, pollination and pest regulation, and the integration of plants and animals.

Contrary to a commonly held view that agriculture is a threat to biological diversity, PLEC has demonstrated globally how farmers in fact enhance the conservation of local biodiversity. They achieve this while attempting to make a living, and improving their own livelihoods. The concepts, methodology and examples developed during the PLEC project contribute to the global efforts to achieve the twin goals of biodiversity conservation and improving local livelihoods.

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Photo: L. Liang, PLEC

Many clusters knew about biodiversity for soil conservation, pollination and pest regulation. PLEC-**Ghana** facilitated some revival of *oprowka*, a traditional no-burn farming practice that involves mulching by leaving slashed vegetation to decompose *in situ*. The practice maintains soil fertility by conserving soil microbes and by humus addition through the decomposing vegetation, and conserves plant propagules, including those in the soil, by the avoidance of fire. In Uganda an expert farmer taught others how to enrich banana gardens with other plant species for apiculture.

LEISA's Farm:

A blog about sustainable family farming

Our new blog (short for weblog) has been running for a few months now, and we would like to invite you to join us!

A blog is another way of linking up with each other. Blogs can follow, comment on and discuss news and current issues immediately. Blogs deliver fresh content in a fast way. They are also a place where new ideas can be presented, and experiences shared in an interactive way.

As you can imagine, the entries on our blog cover many topics, but they are all related to sustainable family farming. Our blog is an accessible way of exchanging information that we think readers would find useful or interesting. There is a new entry every few days, meaning we can cover more news items, events and hot topics than possible in a quarterly magazine. For example, there was a recent entry about a new project which has started putting audiofiles (or podcasts) with agricultural information on the internet, for local radio stations to download and broadcast to farmers in remote areas in northern Peru. There have been updates from international conferences, as well as practical suggestions, like how to purify water using transparent plastic bottles and the energy of the sun. Most posts have links to further information and websites. You can also add your own comments, suggestions or experiences. We hope this serves as another way of inspiring you in your work and daily life, and gives you another opportunity to exchange your ideas with others.

To keep in touch more easily, you can sign up to receive an e-mail each time we add a new post, or you can use RSS. To access both, you need to visit the site. If you have any questions, or have something you would like us to share with the world, send an email to: leisasfarm@gmail.com and we will add some of your ideas to the blog too.

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