



4.10 Ecological restoration in the Atlantic rainforest, Brazil

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Serra da Esperança, Paraná, Brazil

The Serra da Esperança Environmental Protection Area (EPA) is located in the south-central region of Paraná State (Figure 1). The region has one of the most important Araucária forest remnants in Brazil and is considered a conservation priority by the Brazilian Ministry of Environment. EPAs are a type of Protected Area (PA) under the framework of the country's national system of protected areas.¹ The legislation establishes two kinds of PAs: Integral Conservation; and Sustainable Use. An EPA is considered a PA of Sustainable Use and its objective is to protect biodiversity, support effective land use and assure the sustainable use of natural resources.²

The region has a large number of smallholder farmers. Most of them earn their livelihoods from crop cultivation, such as corn, beans and green vegetables, and from dairy cattle. Forests are also an important part of farmers' lives, providing wood, yerba mate (*Ilex paraguariensis*, a kind of tea) and other non-timber products such as araucaria nuts. For many decades, Araucária forests have been exploited in an uncontrolled way; the harvesting of high-value timber, such as *imbuia* (*Ocotea porosa*) and araucaria (*Araucaria angustifolia*) has led to forest degradation.

Extensive agriculture was the main driver of deforestation in the region: today, less than 8% of the Araucária forest original area remains (de Britez 2007). Some places also face low water quality and water scarcity.

The Cultivating Hope project was established to restore riparian forests in smallholder farms, which represent most of the rural land properties in Paraná. Ecological restoration of riparian forests was a need identified in the planning and implementation of the Serra da Esperança EPA, which includes all properties in the area, both private and public. The main purpose of the project is to restore 95 hectares (ha) of Araucária forest. The costs of ecological restoration, such as tree planting and



RESTORING AREAS IN SMALL PROPERTIES TO RECOVER FOREST LANDSCAPES DEMANDS A

LARGE INVESTMENT IN FINANCIAL RESOURCES AND TIME.

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constructing fences in order to protect forests, are normally too high for smallholder farmers to afford.

Figure 1. Serra da Esperança Environmental Protection Area



The organization responsible for carrying out the project is the Brazilian environmental non-governmental organization, Mater Natura. Founded in Curitiba in 1983, its mission is to contribute to the conservation of cultural and biological diversity in order to support livelihoods. Mater Natura develops social and environmental projects, with financial support from various governmental and private institutions. In 30 years, it has established more than 50 partnerships.³ Mater Natura has been engaged in sustainable development initiatives in the region since 2005.

The approach

Three rural communities, in Guarapuava and Inácio Martins municipalities, were selected for the project: Rosa, Monte Alvão and Rio Pequeno. The three communities are located in the Jordão River watershed, Paraná state. The communities were chosen primarily for their interest in restoring riparian forests. In Rosa, some landowners face water supply problems and, in Monte Alvão and Rio Pequeno, there is a great interest in the sustainable harvesting of yerba mate.

Rosa settlement was established in 2001 as part of Brazilian land reform politics and farm size there averages 10 ha. Most farmers make a living from cattle ranching and crops, but many of them also take part in activities not related to agriculture, such as bricklaying, domestic work and trading. In Monte Alvão, families have been living on the land for decades, traditionally making their livelihoods from family farms, cattle ranching and yerba mate, and occasionally working for local logging companies. Monte Alvão has the largest properties in the project; they average 15 ha. In Rio Pequeno properties are smaller and generally not used for agricultural purposes because of proximity to the city

(less than two kilometres). Most people work in the city and many farms in the community are used for recreation. All three communities shelter important water sources that either feed watersheds used for cities' water supply (Jordão River) or hydro-electric power (Areia River).

Initially, the main reason that land-owners participated in the project was the possibility of support for the changes required by Brazil's Forest Code.⁴ This code required every land-owner to protect a 30-metre belt of forest along riverbanks and 50 metres around water sources. For many property owners, this was a hard obligation to fulfill, due to intensive economic use and the difficulty of practising sustainable agriculture in the remaining areas.

In 2012, the Forest Code was replaced by the Forest Law, which reduced the riparian forest belt to five- to eight-metres wide, depending on land size, for smallholder farms. Many specialists agree that such a small area is not enough to protect biodiversity or the quality of rivers and other water sources (Metzger 2010). The new circumstances made the project team re-evaluate the initiative's methodology.

Given the changes to the Forest Code, the project faced great insecurity about land-owners' participation. Consequently, a wide range of partners and stakeholders were included in the project's development. The state governmental environmental institution guided the team on land-owners' concerns about riparian forest width, and local associations helped to maintain farmers' interest.

Riparian forest restoration must allow for the fact that land use in smallholdings is intense: almost the whole area has some economic use, whether for crop cultivation, sustainable forest management or agroforestry. (In contrast, larger properties provide more options for biodiversity conservation or restoration.) Even though many fragments of forest remain in the smallholdings, their conservation status is usually poor, and they require restoration. In order to succeed, projects must take into consideration that it is economically difficult for smallholder farmers to set aside part of their land for the sake of environmental conservation. Alternative approaches to forest restoration must integrate methods of sustainable use of the landscape in order to encourage smallholder and family farmers to observe the forest law. Furthermore, to protect or restore areas larger than those required by law, it is crucial to balance biodiversity enhancement with economic use of lands. Indeed, this has been becoming one of the main purposes of Cultivating Hope.

However, one of the main goals of an EPA such as Serra da Esperança is to promote sustainable use of natural resources through land-use planning. Conventional agricultural practices — for instance, pesticide or herbicide application and chemical fertilization — are permitted only under strict conditions or even forbidden. A number of environmental constraints are described in the EPA management plan.



For this reason, sustainable agricultural methods such as organic farming have been developed for arable land alongside the restoration areas. Organic agriculture is less harmful to the environment and the absence of agrochemicals enhances biodiversity, which may also contribute to the major objective of the project: ecological restoration of the area. Although organic agriculture may have lower yields, operational costs decrease and market prices are higher (around 30%) for organic produce than for conventional agriculture. These factors make many farmers consider organic agriculture a credible alternative.



Both riparian forests and forest fragments in the project region are commonly used for the extraction of yerba mate leaf.⁵ Lately, the product has developed an export market in the United States, which has increased its price. However, the U.S. market mostly demands certified organic yerba mate, whether it is planted or extracted sustainably from forests. Under traditional management, yerba mate trees

grow inside the forest, which enhances leaf quality and, subsequently, market value. The production can be certified as organic under Brazilian legislation. All in all, this makes yerba mate a valuable part of restoration efforts in the region.

Project implementation

In April 2012, the project's objectives and methods were presented to the three communities. The total number of participants was 80 smallholder farmers. They wanted to participate due to their interest in water conservation, yerba mate cultivation and fence-building. Land-owners were informed early on about the minimum restoration requirement of 15 metres of riparian forest; this was up to three times the area demanded by the existing legislation. Despite this requirement, few land-owners quit the project. Furthermore, restoration of larger areas has brought new economic opportunities for land-owners, including participation in payment for environmental services schemes and climate change-related programmes.

The next step was interviewing interested farmers and acquiring relevant information about family income, history of land occupation, motivation to restore riparian forests, and other topics. Environmental aspects, such as occurrence of threatened species, forest composition, forest connectivity, biodiversity conservation status and soil degradation, were assessed. This was essential to develop a land-use map of the project small-holdings. Based on this information, the project team decided to use three methods of forest restoration:

- plantation establishment in areas that were completely deforested;
- forest enrichment in areas with remaining forests; and
- isolation through the building of fences in areas not used for economic purposes for forests that were able to recover after invasive cattle were excluded. Almost every land property has cattle, and isolating the forest from cattle demanded a huge investment in fences.

In the first method, yerba mate was used in 20% of the area; the remaining 80% was planted with other native species. Since the five metres of riparian forest along the riverbank were fully protected, no economic species were planted there. Yerba mate trees were concentrated in the remaining ten metres of the restoration zone.

Labour for restoration was recruited from the communities participating in the project. Local farmers already had knowledge of fieldwork such as fence building and planting. They were trained in the scientific aspects of restoration, such as the original features of the Araucária forest, ecosystem fragmentation and seedling production.

In addition to the sustainable management of organic yerba mate, organic farming has been introduced in the project properties. Since early 2014, Paraná's Technological Institute has supported this activity. Under the framework of the state's Programme of Organic Products Certification, smallholder farmers obtain free technical assistance with and certification for organic agriculture. Certification processes are still being developed and no participant has certified production yet. However, organic farming has already brought benefits to farmers and consumers from avoidance of pesticides and herbicides, and from biodiversity enhancement.

Lessons learned

Restoring areas in small properties to recover forest landscapes demands a large investment in financial resources and time. The practice of fencing adds to project costs and will increase as the number of participating properties increases. The diversity of people and environments involved requires extensive knowledge of the region and flexibility in decision-making processes. In order to achieve conservation objectives, a wide range of alternatives for restoration is needed. In addition, a significant number of smallholder farmers should be involved to ensure that the restoration of many small areas will bring big changes to the landscape mosaic.

To prevent smallholder farmers from going back to their old practices and consequently hindering restoration efforts, the project must carry out detailed land-use planning and develop activities that bring economic returns. Short-term projects such as Cultivating Hope emphasize production systems that farmers already know, in this case yerba mate sustainable production. This reduces the need for training and technical assistance and therefore reduces costs. On the other hand, such an approach restricts the possibilities of implementing a wider variety of sustainable production systems, which might bring benefits for environmental and economic diversity. A long-term perspective should involve additional partners for implementing a range of sustainable systems and providing support to the farmers to manage them.



It is worth noting that monitoring of restored areas is also essential for such sustainable systems to fulfill their ecological and economical potential (PACTO 2010). However, since monitoring is expensive, few initiatives continue to monitor in the medium and long term. Although the government has a legal obligation to protect the remaining Araucária forest, it is widely known for its ineffectiveness. In addition, frequent changes in public policies hinder the operations of the departments that are responsible for the various components of the landscape.

Cultivating Hope's team hopes to get support for monitoring restored areas over a longer period of time in order to show results in the ecological and economical aspects at the landscape level. Organic certification of yerba mate will be a vital part of this effort. The certification process requires a management plan of the property, which must include extraction techniques with a minimal impact on native forest, as well as local-level monitoring of the forest ecosystems.

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Endnotes

1. See Law 9.985/2000.
2. See Law 9.985, Article 15, 2000.
3. More information is available at www.maternatura.org.br.
4. Law 4.771, from 1965, is the former Brazilian Forest Code. The current Forest Law is Law 12.651, from 2012.
5. Yerba mate is a native tree from the Araucária forest. Its leaves are generally toasted and used in soft drinks and cosmetics.

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