

The tide turns for Panama's mangroves

An ITTO project helps to conserve and reforest threatened mangroves on Panama's Pacific coast

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Muddy studies: Local children inspect a mangrove reforestation site. Photo: ANAM

Panama's mangrove ecosystems will play a vital role in the country's efforts to adapt to climate change, but they are under threat. The project described in this article, which was implemented by the National Environment Authority (*Autoridad Nacional del Ambiente*, ANAM), aimed to reduce pressure on Panama's mangroves by transforming the destructive practices of ecosystem users into sustainable use.

A previous ITTO-funded project (PD128/91 Rev.2 (F)), completed in 1997, conducted a mangrove forest inventory in three regions (Chiriquí, Azuero and Chame), generating significant biological and socio-economic information. This information provided an excellent basis for a follow-up ITTO project, PD 156/02 Rev.3 (Phases I and II), the specific objectives of which were to:

- ensure the conservation and sustainable management of 4000 hectares of mangrove forest;
- reforest and enrich 800 hectares of degraded coastal land; and
- initiate agroforestry and reforestation activities using native timber and fruit trees in a 450-hectare area adjacent to forests in the region's middle and lower catchments.

The project target area comprised threatened areas in the west of the provinces of Panama and Coclé and on the Peninsula of Azuero, all on Panama's Pacific coast. The project had three components: mangrove forest management; agroforestry and reforestation; and extension, with the participation of local and neighbouring communities. The strategy was to address the needs of

mangrove forest-dependent communities and ensure their involvement in forest harvesting activities. This was done by organizing and developing small community enterprises and cooperatives with the capacity to provide and market environmental services while also encouraging the conservation and management of the mangrove forests. The outcomes of the project, the two phases of which spanned more than five years, are described below.

Management of 4000 hectares of mangrove forest

In coordination with the government agencies responsible for the use, management, monitoring and harvesting of the country's mangrove forests, the project developed agreed-on methodologies for assessing biophysical (soil and water) and biotic (marine and land flora and fauna) aspects of the mangrove forests. This information was crucial for zoning the area. The methodology was applied in a forest inventory conducted in 4000 hectares of mangrove forest in Chame Bay (Panama Province), with the involvement of local and national forest authorities, a national university and neighbouring communities.

Four communities in Chame Bay were trained in various aspects of mangrove forest management, including the selection of seed trees, the collection of mangrove propagules and seeds, the establishment of mangrove nurseries, mangrove reforestation, and various techniques for the development of mangrove forest management plans. A plan for the management of the mangrove forests in Chame Bay was developed with the involvement of mangrove forest users and stakeholders—local authorities, communities, professionals and researchers. A zoning

map was also produced with the involvement of local communities, specifying areas for sustainable use, conservation and rehabilitation.

The approach developed for the management and harvesting of mangrove forests in Chame Bay can also be applied in the other project areas (Coclé, Los Santos, Herrera and Chiriquí). Under the management plan, the following rules must be applied:

- management units can only be established within the sustainable-use zone;
- harvesting permits cannot be issued within 25 meters of a riparian protection zone or 25 meters of an *albina* (coastal salt flat);
- natural boundaries such as rivers, estuaries and roads should be considered in the establishment of forest stands; and
- the management unit allocated to each community should be no larger than the area established for this purpose in the management plan.

The project stimulated considerable community learning by ensuring compliance with the methodology established for forest harvesting operations and by allowing and encouraging a wide range of uses. The project also assisted communities to undertake the following activities in their designated sustainable-use areas:

- Inventory and tree measurement, in which all trees with diameter at breast height greater than or equal to 7 cm were assessed. Stem form was classified and the number of trees per diameter class in each management unit estimated. According to the management plan, 15% of the best trees (“type A”) may be harvested, while the rest are to be retained as seed sources.
- The establishment of mangrove iguana and rabbit farms.
- The production of honey from African *Avicennia* bees.

- The extraction and production of red mangrove charcoal using more efficient and less-polluting kilns, combined with tree-replanting as appropriate. Community organizations can sell their charcoal directly to supermarkets, which is more lucrative for them.

Based on the experience gained in Chame Bay, the project provided training on sustainable mangrove management to charcoal producers, government officials and people among the communities of Monte Oscuro, Sajalices and El Espavé.

800 hectares of mangrove forests rehabilitated

In cooperation with mangrove forest communities and technical and professional staff in related agencies, the project established and validated criteria for the selection of enrichment planting areas and for reforestation plans. This process was aided and enriched by an exchange of experiences on mangrove forest restoration and harvesting with the ITTO-funded Cispata Bay project in Colombia (PD 060/01 Rev.1 (F)).

Also in cooperation with local communities, nine mangrove nurseries were established near estuaries, harbours and streams to produce seedlings of *Rhizophora racemosa*, *R. mangle* and *Pelliciera rhizophorae* (piñuelo). In Phase 1 of the project, 562 hectares of mangrove forest were rehabilitated with the participation of community support groups, using the three previously listed species as well as *Avicennia germinans*. It is significant that four mangrove species were used in the restoration effort because many similar initiatives use only a single species (*R. mangle*). In the project’s second phase, community groups collected and selected propagules and identified the best sites for planting the various mangrove species to be used in rehabilitation. Rehabilitation efforts focused on those areas under logging pressure and, in some other areas, attempted to accelerate natural regeneration processes.

In cooperation with the existing mangrove nurseries, the Directorate for the Promotion of Environmental Awareness (*Dirección de Fomento a la Cultura Ambiental*) encouraged schools around Chame Bay and in four other regions to create their own nurseries as a way of promoting environmental awareness and assisting in the rehabilitation program. Each school developed the capacity to produce seedlings of *R. mangle* and *P. rhizophora*. Bag filling, nursery construction, irrigation and plant-tending activities were carried out by community groups, teachers and students. Table 1 shows the total area reforested in the five regions in the project area, and the species and number of propagules used. Following completion of the project, an additional 45 hectares in Chame Bay had been



Sweet: Chame Bay community members undertaking mangrove apiculture with *Avicennia* bees. Photo: J. Leigh

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Preparing to plant: Mangrove nursery in Chame Bay. Photo: J. Leigh

reforested with *R. racemosa*, and reforestation activities were continuing in the remaining regions using *R. mangle* and *P. rhizophora*.

Table 1. Reforestation targets achieved by the project

Region	Species	Number of propagules	Reforested area (ha)
Chame Bay	<i>R. racemosa</i>	291 835	261.5
	<i>R. mangle</i>	439 070	390.1
Cocle	<i>R. racemosa</i>	13 300	12.0
	<i>R. mangle</i>	147 974	133.0
Herrera	<i>R. mangle</i>	4444	4.0
Los Santos	<i>R. mangle</i>	22 700	15.1
Chiriquí	<i>R. racemosa</i>	14 900	5.1
Total		934 223	820.8

450 hectares allocated to agroforestry and reforested

Eighteen multiple-use native species were selected for propagation. Six family nurseries and eight community nurseries were established in the project area. Nine communities were trained in, and are working on, the establishment of forest nurseries and the production of organic manure as a sustainable environmental business activity.

Family and community nurseries produced 41 509 seedlings in the first year of operations, generating income of 6226.55 Panamanian balboa (PAB), which was distributed among community organizations, benefiting 134 people (60% of them women). In its first phase, the project purchased seedlings at a price of PAB 0.15 per seedling. Seedling production is now the responsibility of local communities, who received training in this activity.

The rehabilitation target set in Phase 1 of the project was met—251 hectares were planted with multiple-use native species in the project's area of influence in the middle and lower catchments of the region. The agroforestry component of the project benefited 967 people in the communities of Panama Oeste, Coclé, Herrera and Los Santos. A database was developed on trees planted

in selected plots, including tree type and location. An agreement was signed with landowners for the tending of planted trees, which will ensure the continuity and monitoring of activities and facilitate the assessment of impacts on the communities involved in the project. In the final year of the project, a total of 142 hectares was reforested and progress was made in the construction of nine community nurseries: one in Monte Oscuro; four in Coclé; one in París de Parita (Herrera); two in Los Santos; and one in Chiriquí. Reforestation sites were selected, taking into account the need to rehabilitate the middle and upper basins of rivers surrounding the mangrove forest areas. These activities were carried out with the participation of community groups in all five regions. The plots reforested in the first four years of project operations were assessed in the final year; there was a seedling survival rate of 80% and average height growth of 1.5 meters per year.

Conclusion

The project made considerable progress in the quest to sustainably manage Panama's precious Pacific coast mangroves. A management plan developed with the participation of the Chame Bay community for a 4000-hectare mangrove forest is serving as a model for other communities. A significant area of mangrove forest has been rehabilitated, and buffer zones have been planted with local species.

Communities now have experience in establishing and managing seedling nurseries, and environmental awareness has been raised among students and teachers in five project communities. In the province of Chiriquí, for example, the project rehabilitated mangrove stands of *P. rhizophorae*, which had been displaced by a fern known as *negra jorra* (*Acrostichum* species). In these rehabilitation activities, the project used *P. rhizophorae* seedlings produced in community nurseries with ANAM's assistance. The project also rehabilitated areas of *juncals* (reedbeds) in the Cenegón del Mangle Wildlife Sanctuary (Herrera) with the participation of the París de Parita community, using *Avicennia germinans* and *Laguncularia racemosa*, species that occur naturally in the area but which were being displaced by reeds.

A two-year mangrove forest conservation and sustainability project with community participation in environmental services, partly inspired by this ITTO project, has been submitted by ANAM to HSBC Insurance. This follow-up project will encourage the development of a range of mangrove-based income-earning activities, such as marine culture, forest harvesting, charcoal production, honey production and tourism activities such as bird-watching, boat rides, nature tours and iguana farming.

The final report of this project (Spanish only) is available on request (leigh@itto.int).