

## COURSE REPORT

# Ecological Restoration Strategies for Productive Landscapes

ELTI Focal Training Sites  
District of Pedasí, Province of Los Santos  
December 17-21, 2018

A field course organized by:  
The Environmental Leadership & Training Initiative (ELTI),  
The Peregrine Fund and the Association of Livestock and Agrosilvopastoral Producers of Pedasí (APASPE)



Photo: Saskia Santamaria

Participants visit a model farm where different restoration and sustainable ranching activities have been implemented.



ESTRATEGIAS PARA  
LA RESTAURACIÓN ECOLÓGICA

**Background:** The Darien Province and adjacent Wargandi and Embera-Wounaan indigenous territories contain most of Panama's remnant natural forest ecosystems, rich in diverse flora and fauna. Nevertheless, the region has suffered in recent years from increased deforestation and land degradation from unsustainable logging and conventional cattle ranching. These practices have impaired ecosystem services, including the fragmentation of local wildlife habitat for emblematic megafauna such as the harpy eagle (*Harpia harpyja*), the national bird of Panama. To avoid further forest degradation and negative environmental consequences, land-use decision makers need to learn about more sustainable agricultural activities and be trained on how to implement them. Unfortunately, decision makers often have limited opportunities to become familiar with alternative practices that restore ecosystems and permit traditional agrarian livelihoods.

ELTI is an initiative of:

**Yale** SCHOOL OF FORESTRY &  
ENVIRONMENTAL STUDIES



Photo: Eli Wittum

Participants learn about the long and short-term benefits of integrating timber species into livestock forage banks.

To strengthen ecological restoration capacity, ELTI offers practical, hands-on field-based courses, facilitated at ELTI's Focal Training Sites located in the Azuero Peninsula. Course participants learn the importance of the scientific method in the development of sound restoration strategies from on-going research and group exercises in the model farms, interpretative trail networks, and demonstration areas. To communicate the practices and benefits of forest restoration in a practical and culturally appropriate manner, ELTI integrates landowners from the Association of Livestock and Agrosilvopastoral Producers of Pedasí (APASPE) as co-facilitators. APASPE is a local organization of environmental leaders at the forefront of transforming the Panamanian ranching sector by promoting the use of sustainable practices to benefit the environment, producers, their families, and other inhabitants of the region.

This training was offered to Emberá and Wounaan community leaders from the Darien, who were interested in strengthening their knowledge and practical skills of forest restoration and sustainable agricultural production. Over a period of five days, course participants learned how to design and implement strategies to increase forest cover through agroforestry systems. Additionally, participants had the opportunity to learn and exchange experiences, concepts and practical tools with ELTI facilitators, local experts, and peers.

**Course Objectives:** The overall goal of the course was to educate participants on the role that forests play in providing ecosystem services, to foment restoration strategies into agricultural landscapes for ecological restoration and sustained production.

**Content:** The course was divided in six training modules, illustrated through introductory lectures, field-based demonstrations, and group exercises facilitated by ELTI staff and APASPE members, as follows:

**Module 1:** *Forest ecology and ecosystem services*

**Module 2:** *Deforestation and soil degradation*

**Module 3:** *Strategies for restoring ecosystem processes in agricultural landscapes*

**Module 4:** *Agroforestry systems and the propagation of native tree species*

**Module 5:** *The role of community associations in conducting ecological restoration*

**Module 6:** *Farm management planning for sustainable production and increased forest cover*





Participants learn about the importance of leguminous nitrogen fixing species to advance restoration of degraded land.

**Field-Course Format:** This course took place over five days at ELTI's Focal Training Sites in the tropical dry forest, located in the Province of Los Santos in the Azuero Peninsula. These sites demonstrate the varied biophysical and socio-economic contexts of different types of land use: (1) the Achotines Forest Reserve, a mature tropical dry forest; (2) the Madroño property, an abandoned cattle pasture in the early stages of a regenerating secondary forest; (3) IDB Forestal, a native species tree plantation that incorporates cattle grazing in the understory; and (4) the APASPE model farms, which are privately-owned by members who have established silvopastoral and agroforestry systems, home gardens, and riparian area restoration. The following activities occurred throughout the week:

**Day 1:** Course participants arrived at the Achotines Tuna Laboratory and were introduced to the laboratory's activities and given a tour of the installations. Saskia Santamaría (Neotropics Training Program Associate) facilitated an introductory presentation about ELTI and the objectives of the course. Jacob Slusser (Neotropics Training Program Panama Coordinator) delivered a lecture on the importance of ecosystem services and tropical dry forest ecology.

**Day 2:** Jacob led a walk through ELTI's interpretive trail system, within the Achotines Forest, where participants visited six different demonstration areas covering the following topics: dry forest species identification, functional characteristics, successional guilds of key tree species, forest regeneration and successional phases, and buffer zones in riparian areas. In addition, participants worked in groups to conduct soils assessments on macro-fauna, soil structure, texture, infiltration, and pH, comparing differences between a ridgetop and lowland forest. Participants gained a better understanding of the species, interactions and processes that occur to maintain forest ecosystem services.



Participants practice seed scarification and different planting methods in a seed germinator.

After the walk, Jacob presented on the range of passive to active forest restoration strategies that can be utilized in agricultural landscapes. Following the lecture, Jacob led field visits to two properties demonstrating different restoration strategies. At the Madroño property, participants were shown the results of passive and assisted natural regeneration (ANR) activities in a twelve-year-old abandoned cattle pasture. The practices ranged from eliminating competition around desired species to enrichment planting where favored species were absent. Participants also visited IDB Forestal, an active restoration example where native tree species plantations were established, and cattle graze in the understory once the trees reach an optimal height. The owner's objectives and management regime were explained to the participants and the two sites were compared in terms of their success to achieve the owner's different goals while considering cost efficiency.

In the evening, Jacob delivered an introductory lecture about sustainable ranching methods via silvopastoral systems (SPS). Jacob presented SPS not just as a model for production, but as a tool to facilitate ecological restoration by increasing biodiversity and utilizing conservation practices to recuperate ecosystem function.

**Day 3:** Due to a scheduling conflict, Belgis Madrid, President of APASPE, was unable to present at the course. Therefore, Saskia Santamaría presented on APASPE's experience of creating and managing a community-based group. She discussed the process of how APASPE obtained their legal status, the planning and application for project funding, the implementation and management of their project, and strategies used for disseminating their successes and challenges to other interested parties.

Participants then traveled to the small town of Los Asientos to meet APASPE members and visit the El Ñopo Farm of Odielca Solís, APASPE's Treasurer. Participants were given a tour of the farm by Odielca, visiting several restoration strategies and new technologies implemented including: solar water pump and cattle aqueduct system, drip irrigation system, agroforestry systems with shade coffee, Persian limes and short statured plantains, forage bank, intensive silvopastoral system, restoration of riparian areas via natural regeneration and native species reforestation conducted in a wildlife corridor. During the visit, Odielca discussed many of the challenges and lessons learned from implementing restoration and sustainable ranching activities over the past five years. Participants were very impressed of the productive results from such a small farm and inspired by Odielca's message of perseverance and faith in sustainable practices.





Participants conducting a monitoring protocol for trees planted in a biological corridor.

After lunch, participants returned to Odielca's farm to focus on the establishment of a small-scale community tree nursery and techniques for propagating native tree species. Before commencing, Jacob reiterated that reforestation should always be the last option when developing a forest restoration strategy due to its complexity and high cost in terms of time and resources. To start, Jacob quizzed participants on the objectives and factors for developing a nursery. Next, participants learned about different seed types, harvesting techniques, storage and scarification processes and then practiced seed treatments and planting practices. Participants then learned how to make substrate and practiced mixing and filling nursery bags and other containers. Finally, they transplanted seedlings from the seed germinator bed into prepared bags. To conclude the nursery session, Jacob reiterated common mistakes to avoid and other best practices that are useful to propagate trees for planting.

For the reforestation activity, Jacob led a field-based session on how to monitor and evaluate a reforestation plot established in a protected wildlife corridor by the prior course participants. Jacob discussed the importance of providing regular maintenance including fertilizing, mulching, and digging mini-swells and barrier walls for sediment and water retention. He also demonstrated how to conduct simple height measurements of saplings to gauge growth rates. Participants then worked in groups to conduct a monitoring protocol of the 50 trees planted, evaluating the trees on survival, height and maintenance needs.

**Day 4:** The final full day of training focused on putting the course concepts into practice. Participants visited the Los Yescos farm and received a guided tour by owner and APASPE member, Dolores Solís. During the visit they learned about the restoration strategies conducted including; a home garden, silvopastoral systems and agrosucessional systems integrating timber, agricultural crops and cattle forage species. Some areas of the farm had suffered high levels of degradation due to conventional cattle ranching practices. Participants focused on these degraded areas of the farm to work in groups and conduct a





Participants work in groups to identify degraded areas and then propose restoration activities.

site diagnostic utilizing a conceptual restoration model to develop their strategy to increase forest cover. Groups presented their plans and received feedback from Dolores as well as ELTI course facilitators.

For the final exercise, participants worked in groups to develop farm management plans designed for their properties. Jacob provided an introductory lecture on the ten-step process, including: drawing a farm map, analyzing and rating their current farm via eight indicators, planning restorative activities to resolve farm problems, and then updating the farm map to illustrate planned interventions. Each group presented and received feedback by the facilitators. Although conducted as a course exercise, the farm plan is also a tool that participants will use to implement restoration efforts. In addition, with the help of ELTI collaborators, it is hoped that participants will utilize the plan to establish model farms that can serve to train others in the future.

Saskia presented ELTI's Leadership Program and the types of resources and support that ELTI provides to its alumni. She discussed various examples of how ELTI alumni have requested support and implemented course themes in the field. Participants filled out course evaluations and submitted them to ELTI Staff. To close the course, certificates were presented to the participants during a graduation ceremony and a group photo was taken. Afterwards, participants, APASPE members and ELTI Staff joined together for a final dinner to celebrate the completion of the course.

**Day 5:** Participants departed back to their communities.



Participants pose for a group photo after the graduation ceremony.

**Instructors and Coordinators:** The course was facilitated by ELTI's Neotropical Training Program Staff: Jacob Slusser (Panama Coordinator) and Saskia Santamaría (Program Associate). Saskia introduced the course objectives to the participants, as well as ELTI's Leadership Program at the end of the course. Jacob delivered introductory lectures and field demonstrations on the concepts of ecosystem services, forest ecology, restoration strategies, native tree species propagation and nursery establishment and implementing agroforestry systems. Jorge Gutiérrez (ELTI consultant) along with APASPE members Odielca Solís and Dolores Solís facilitated model farms visits, explaining in detail the variety of restoration strategies and sustainable systems established. In addition, course collaborator José Vargas (The Peregrine Fund Panama Country Coordinator) assisted with logistics and group exercises. Finally, Eli Wittum, Multi-Media Specialist and Peace Corps Response Volunteer, documented the event via photography and video.

**Participants:** The course was offered to an extensionist from Panama's Ministry of Environment (MiAmbiente) and Emberá and Wounaan indigenous community leaders from the Darién Province and adjacent Wargandi and Embera-Wounaan indigenous territories who will be implementing forest restoration, agroforestry and sustainable livestock production as part of a recent project they were awarded.

**Course Follow-up:** Course alumni will work in collaboration with The Peregrine Fund Staff to implement farm management plans as a first step for putting course themes into action. ELTI will also provide continued support via future training opportunities to help alumni become community environmental leaders and establish model farms. ELTI's goal is to empower their alumni so that they make positive land-use decisions and educate and inspire others to do the same.

**Cost:** This course was offered at no cost for 13 selected participants thanks to collaborative support from The Peregrine Fund and the generous donation of the Arcadia Fund (<http://www.arcadiafund.org.uk>).

*This event was possible thanks to Arcadia Fund, whose Environmental Conservation grants support programmes that protect and enhance biodiversity, and provide field training and academic research.*