

# SIX DAYS FIELD VISIT REPORT

# PANAMA 2023

District of Pedasi, Azuero Peninsula,  
Panama | March 29 – April 3, 2023



Organized by:



Environmental  
Leadership &  
Training Initiative

Yale SCHOOL OF THE ENVIRONMENT

Written & reported By

*Arun Kashyap*

FARMER, SOCIAL WORKER,  
ENVIRONMENTALIST &  
ACTIVIST



## LOCATION

Tropical dry forests are indeed important ecosystems in Latin America, providing vital ecological services such as carbon sequestration, soil conservation, water regulation, and habitat for biodiversity. These ecosystems are particularly important in **Panama's Azuero Peninsula**, where they have been subject to extensive agricultural and cattle ranching practices that have led to deforestation and degradation.

The six-day program focuses on tropical dry forest ecology and allows participants to deepen their understanding of this ecosystem. The program also covers forest restoration and conservation strategies, particularly in landscapes impacted by human activity.

## DURATION

March 29, 2023 – April 3, 2023 (6 days)

## PLAYERS

Report layout & writing by: Arun Kashyap

Main instructional team: Jacob Slusser  
Saskia Santamaría  
Schmemily Figman

Volunteer Support: All Participants

## COURSE ORGANIZED BY:



Environmental  
Leadership &  
Training Initiative

Yale SCHOOL OF THE ENVIRONMENT



### **1** Pseudobombax septenatum

Also known as the ceiba barrigona or woolly bombox, is a species of flowering tree in the family Malvaceae. It is native to Central America and northern South America and can be found in countries such as Mexico, Belize, Guatemala, Honduras, Nicaragua, Costa Rica, Panama, Colombia, and Venezuela. The leaves are compound, with 5–7 leaflets arranged in a palmate pattern. The leaflets are ovate to lanceolate in shape, with a pointed tip and a serrated edge. The tree's flowers are large and showy, with five pink to purple petals about 5 cm (2 inches) long. The flowers bloom in the dry season, usually from February to May. Bees and bats pollinate the tree.

The fruit of *Pseudobombax septenatum* is a woody capsule that is about 10 cm (4 inches) long. When mature, the capsule splits open to reveal numerous small seeds covered in a woolly, cotton-like fibre that helps them disperse in the wind.

The woolly bombox is an important tree in its native range used for various purposes, such as timber, fibre, and medicine. The tree is also considered sacred by some **indigenous communities**, including the **Maya and the Aztecs**. And is associated with fertility, abundance growth, and the cycle of life and death. By playing a role in cultural practices and beliefs, the tree contributes to the region's cultural heritage.



## Association of Livestock and Agrosilvopastoral Producers of Pedasí (APASPE)

The Association of Livestock and Agrosilvopastoral Producers of Pedasí (APASPE) is a non-profit organization based in Pedasí, a small town located on the Azuero Peninsula in Panama. APASPE was established in 2002 with the goal of promoting sustainable livestock and agroforestry practices, as well as the economic and social development of the local community.

APASPE's main objectives include promoting the conservation and sustainable use of natural resources, improving the productivity and competitiveness of local livestock and agroforestry enterprises, and strengthening its members' organizational and technical capacities. The association also aims to promote fair trade and marketing opportunities for local products and raise awareness about the importance of sustainable agriculture and the preservation of traditional farming practices.

APASPE has implemented several projects and initiatives over the years, including establishing a community-based seed bank, promoting agroforestry and silvopastoral systems, developing sustainable livestock production techniques, and organising educational and training programs for its members. The association also works closely with local and national authorities, other organizations, and stakeholders to advocate for policies and initiatives supporting sustainable agriculture and rural development.

Overall, APASPE plays an important role in promoting sustainable agriculture and rural development in the Pedasí area and serves as a model for other similar organizations in Panama and beyond.



## 2 Howler monkey on the Azuero Peninsula

The Azuero Peninsula in Panama is home to a variety of wildlife, including howler monkeys. Howler monkeys and the loudest monkeys in the Americas are known for their distinctive vocalizations that can be heard from over a mile away. Howler monkeys are arboreal, meaning they spend most of their time in trees. They primarily eat leaves but will also consume fruit and flowers when available. They live in groups of up to 18 individuals, typically led by a dominant male. In the Azuero Peninsula, howler monkeys can be found in the forests and jungle areas. They are an important part of the local ecosystem, playing a role in seed dispersal and maintaining the balance of their habitat.

In Ngäbe culture, the howler monkey is believed to have a close relationship with the spirit world and is considered a messenger between the physical and spiritual realms. The howler monkey's distinctive vocalizations are thought to represent the voice of the spirits. The Buglé people also hold the howler monkey in high regard and have various traditional beliefs and practices associated with it. For example, the Buglé believe that if a howler monkey bites a person, they must perform a specific ritual to avoid illness or bad luck.



## 3 Harpy Eagle

The **Harpy Eagle** is a large bird of prey found in Central and South America, primarily in tropical rainforests. It is one of the largest species of eagles, with a wingspan of up to 7 feet and weighing up to 20 pounds. The Harpy Eagle is known for its striking appearance, with a crown of feathers that resemble a headdress and piercing yellow eyes. It is a powerful hunter, feeding primarily on tree-dwelling mammals such as sloths and monkeys, but it has also been known to prey on birds and reptiles. The Harpy Eagle is considered a threatened species due to habitat loss and hunting, and conservation efforts are underway to protect its populations.

## Discussion on the Background of Panama forest management from the earlier times.

Panama's forests have a long history of management and use by indigenous communities. Before the arrival of European colonizers in the 16th century, the forests of Panama were home to a variety of indigenous communities, including the Ngäbe, Buglé, and Emberá peoples. These communities had developed intricate systems of forest management and used them based on their intimate knowledge of the local ecology and their spiritual beliefs. For example, the Ngäbe people have long practised swidden agriculture, which involves clearing small plots of land in the forest, burning the vegetation, and planting crops. This method allows the soil to regenerate naturally, and the Ngäbe rotate their fields every few years to enable the forest to recover. The Buglé people, on the other hand, have traditionally used the forest for hunting, fishing, and gathering wild fruits, nuts, and medicinal plants.

However, with the arrival of European colonizers and the subsequent exploitation of Panama's natural resources, these indigenous communities' traditional forest management practices came under threat. The Spanish brought a new economic system that emphasized extracting valuable resources like timber, precious metals, and rubber, often at the expense of the environment and the people who depended on it.

In the 20th century, Panama underwent significant economic development, including expanding agriculture, mining, and hydroelectric power generation. These activities further pressure the country's forests, leading to deforestation, soil erosion, and biodiversity loss.

However, in recent years, there has been growing recognition of the importance of sustainable forest management and the role of indigenous communities in preserving and managing these vital ecosystems. As a result, the Panamanian government has introduced a range of policies promoting sustainable forest management, including establishing protected areas and community-based conservation initiatives.

Panama's forests have suffered significant degradation over the past 100 years, like other tropical developing nations. Due to an increasing agricultural border, Panama lost over 35% of its forest cover in the last 30 years of the 20th century. The Azuero Peninsula, a dry forest habitat and the most intensively deforested area of Panama, is characterized by monoculture agriculture and livestock landscapes. The region is shown to be extremely vulnerable to droughts due to current climate changes and major El Nio effects due to the lack of forest cover and overall ecosystem resilience. Conventional cattle ranching is one common land use that contributes to the continued degradation of the environment by encouraging hostile, treeless landscapes through the removal of tree regrowth, the planting of invasive, exotic pasture grasses, recurrent fires, excessive use of agrochemicals, and overgrazing. These pasture landscapes consequently present low agricultural productivity, environmental deterioration, and increasing climatic sensitivity, which poses a danger to rural lives and the ranching industry.

Yet, there is still a gap between restoration science and practice, leading to poorly executed restoration plans based on scant data. Hence, decision-makers must increase their ability with the most recent restoration knowledge and methods in order to promote the restoration of degraded lands effectively. With intensive field-based courses held in a variety of biophysical and socioeconomic contexts, one way to improve capacity and transmit restoration knowledge is. Participants in field-based courses get the chance to actively participate in practical activities that highlight the value of using scientific research and native knowledge to design effective restoration solutions. Since 2013, ELTI has run these programs at its Focal Training Locations in Panama.



Photo: Schmemily Figman

A short introduction meeting in a space under the Gulmohar tree (Indian Name) which is also known as the Flame Tree, and its scientific name is *Delonix regia*. The Gulmohar is native to Madagascar, but it has been widely planted in many tropical and subtropical regions around the world, including India.



Black (*Avicennia germinans*) & Red Mangroves (*Rhizophora mangle*) are commonly found on the coastlines of this campus. Black mangroves are more tolerant of saltwater than Red mangroves because of the specialized cells that allow them to excrete excess salt through their leaves.



a. Panamá Viejo, also known as Panamá la Vieja, is the remaining part of the original Panama City, the former capital of Panama, which was destroyed in 1671 by the Welsh privateer Henry Morgan.

b. The F&F Tower, also known as El Tornillo ("The Screw"). A 242.9-meter 52-storey skyscraper in Panama City, Panama, designed by Pinzon Lozano & Asociados Arquitectos.

c. Old Panama City is the Colonial district of Panama City, sitting on the Pacific entrance of the Panama Canal. Literally translating to "Old Quarter," Casco is known for its colourful buildings that were built by the Spanish and French in the late 17th century.

d. Participants from one tear long certificate course on  
 e. The Museum of Old Panama (Museo de la Real Aduana de Panamá) is a museum located in Panama City, Panama, near the ruins of the original city of Panama Viejo.



f. The Panama Canal is approximately 50 miles (80 kilometres) long, an artificial waterway that connects the Atlantic & Pacific Oceans through the Isthmus of Panama in Central America. The canal was first built by the United States in the early 1900s & was transferred to Panamanian control in 1999. Do watch **Morgan Freeman** on 3D movie in IMAX on **Panama Canal: A land divided – a World united.**

## Achotines Laboratories



The Achotines Laboratory was inaugurated in 1985. Early research through 1993 involved laboratory and field studies of early life stages of near-shore tropical tunas (link to \*publications list). At-sea surveys were carried out to describe the distribution and abundance of larval tunas in the northwestern Panama Bight. Laboratory and in situ studies were conducted to study the ageing and growth, nutrition, endothermy ontogeny, and vision development in larval and early-juvenile tunas. The Achotines Laboratory provides a number of culture and support facilities with an infrastructure that accommodates many types of marine fisheries research and other activities.

Vernon Scholey: Achotines Laboratory Director  
Achotines Laboratory Los Santos Province, Republic of Panama  
Tel: +507 832 8166

\*Publications: <https://www.iattc.org/en-US/About/Achotines/Publications>

## Introduction of ELTI and course objectives

The Environmental Leadership & Training Initiative (ELTI) work in the Azuero Peninsula and other regions in Latin America highlights the importance of balancing conservation and production goals in agricultural landscapes to ensure the long-term sustainability of both ecosystems and human livelihoods. (ELTI) works in this region to build the capacity of land users and decision-makers to understand the role of forests in providing ecosystem services



These ecosystems are particularly important in Panama's Azuero Peninsula, where they have been subject to extensive agricultural and cattle ranching practices that have led to deforestation and degradation.

Overall, ELTI's work in the Azuero Peninsula and other regions in Latin America highlights the importance of balancing conservation and production goals in agricultural landscapes to ensure the long-term sustainability of both ecosystems and human livelihoods.

## Course Background:

The course was offered to online certificate course students from various batches after covid time, including the running one. The "Tropical Forest Restoration in Human-Dominated Areas" workshop gave students a realistic understanding of tropical dry forest ecology, degradation, and forest restoration techniques in a complex human-dominated landscape with varied cultural and socioeconomic settings that influence land management over the course of six days. This field-based course was conducted at ELTI's Focal Training Sites in Azuero, which use a network of interpretive trails and demonstration sites to communicate ecological principles. Also, participants engage with landowners on visits to their model farms and see firsthand their motivations for making decisions regarding land management.

## Panama field Course Objectives:

The course's main objectives were to show participants different restoration options that can be incorporated into agricultural landscapes to restore forest cover ecological function, sustain productivity, and supplement Tropical Forest Landscapes: Conservation, Restoration & Sustainable Use, an online certificate program by the Environmental Leadership & Training Initiative (ELTI) at the Yale School of the Environment.



# The DAY TWO

30th March, 2023

## GALLERY

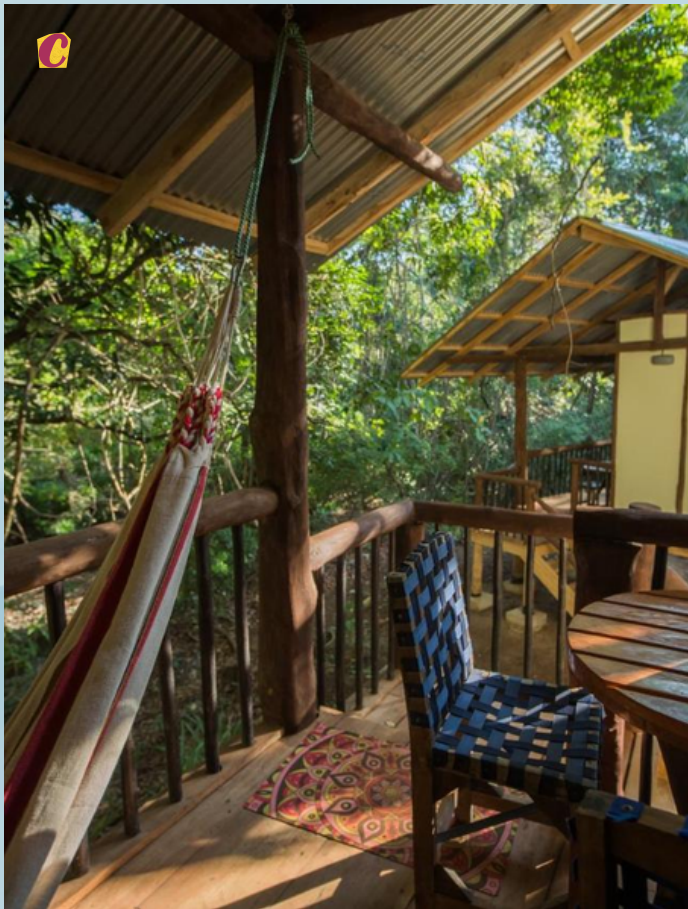


a

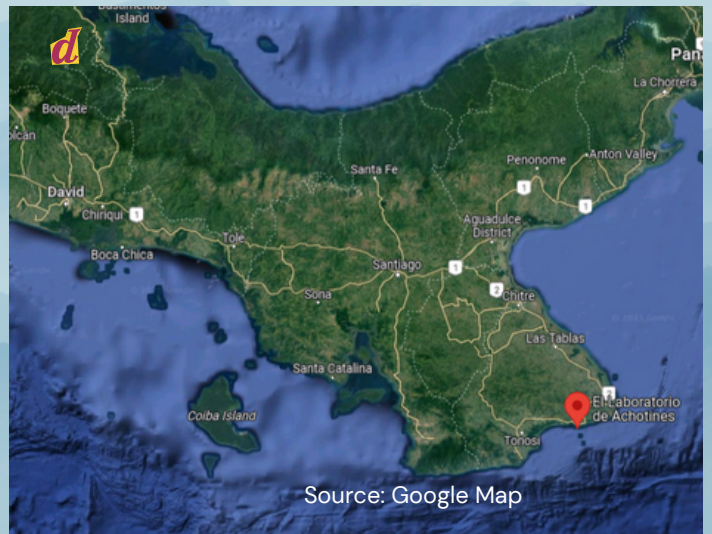


b

Source: Google Map



c



d

Source: Google Map



e

Source: <https://www.iattc.org/en-US/About/Role>

a. Known as peach palm fruit, **Pixbae** is a truly Panamanian fruit. It's native to the tropical forests of Central. But unlike most fruits that can be eaten raw, the pixbae fruit needs to be boiled for at least two hours. Otherwise, it's not edible. This is why it's called the "noble Panamanian fruit."

b. The IATTC is the international commission responsible for the long-term conservation and sustainable management of tuna and tuna-like species and other species in the Eastern Pacific Ocean.

c. Eco Venao Lodge (my room number 3) is set within a 140-hectare (346-acre) reforestation project. Eco Venao Lodge is located in Playa Venao, a 30-minute drive from Pedasí and 6.2 mi from Isla Cañas.

d. Map showing the satellite location of Achotines Laboratory

e. The Inter-American Tropical Tuna Commission (IATTC) is the regional fisheries management organization (RFMO) responsible for the conservation and management of tuna.

### Achotines forest reserve trails and forest reserves

The Achotines Forest Reserve is a protected area located on the Azuero Peninsula in Panama. The reserve covers an area of approximately 2,534 hectares. It is home to a diverse range of flora and fauna, including various species of birds, reptiles, and mammals, such as howler monkeys.

Visitors can explore trails within the Achotines Forest Reserve to experience the natural beauty of the area. These trails range from easy to moderate difficulty and vary in length, from short walks to longer hikes.

One of the most popular trails in the reserve is the Los Pilares trail, which is a 3.5 km (2.2 miles) round-trip hike that takes visitors through a dense forest and leads to a stunning waterfall. The trail is well-marked and takes approximately 2-3 hours to complete.

Another trail in the reserve is the Cerro Hoya trail, which is a longer and more challenging hike that takes visitors to the summit of Cerro Hoya, the highest peak in reserve. This trail is approximately 15 km (9.3 miles) round-trip and takes approximately 8-10 hours to complete.

In addition to hiking trails, the Achotines Forest Reserve also has a demonstration area where visitors can learn about flora and fauna of the area. The demonstration area includes an arboretum, a butterfly garden, and a small museum with exhibits on the reserve's natural history and conservation efforts.

The Sendero del Puma trail is a 2.5-kilometre trail that takes visitors through the forest and offers stunning views of the surrounding landscape. Along the trail, visitors may have the opportunity to see various wildlife, including howler monkeys, white-tailed deer, and toucans.

Another trail in reserve is the Sendero de las Orquídeas, which is a shorter trail that takes visitors through a section of the forest that is home to many species of orchids. Visitors may also see hummingbirds and other bird species along the trail.

In addition to the hiking trails, the Achotines Forest Reserve has a demonstration area where visitors can learn about sustainable forestry practices and see how the forest is managed for conservation and resource extraction. The demonstration area includes an interpretive trail that showcases the different types of trees and plants found in the forest, as well as information about the local ecosystem and the role of the forest in the surrounding communities.

Overall, the Achotines Forest Reserve is a great place for visitors to experience the natural beauty and biodiversity of the Azuero Peninsula, while also learning about the importance of conservation and sustainable forestry practices.

I would like to let you know that visitors to the Achotines Forest Reserve should be prepared for outdoor activities and bring appropriate gear, such as hiking boots, water, sunscreen, and insect repellent. Visitors should also be respectful of the natural environment and adhere to the reserve's rules and regulations to help preserve this beautiful area for future generations.

### Field visit: Achotines forest reserve (old growth forest)

Jacob's field trip to the Achotines Forest Reserve's interpretive trail network involved visiting nine distinct demonstration areas to discuss various topics such as successional guilds, species functional characteristics, identification of tropical dry forest species, forest regeneration and successional phases, and hydrological cycles in riparian areas. The visit aimed to compare the differences between a ridge top and a lowland forest and quantify multiple ecosystem services in a baseline forest by quickly inventorying the forest within the mature forest.

**Cedrela odorata**, commonly known as Spanish cedar or Cedro, is a tropical hardwood tree species native to Central and South America. It belongs to the Meliaceae family, including other valuable timber trees such as mahogany and African mahogany. Spanish cedar is a large tree that can reach up to 40 meters (130 feet) in height, with a trunk diameter of up to 1.5 meters (5 feet). It has a straight trunk and a conical or rounded crown, with branches often drooping. The bark is grey-brown and fissured. Spanish cedar wood is highly valued for its attractive appearance, durability, and resistance to decay and insect damage. In addition, it is lightweight, easy to work with, and has a pleasant, sweet fragrance. It is used for various purposes, including furniture, cabinets, doors, window frames, musical instruments, and cigar boxes. Wood is also used in the construction of boats and the production of veneer and plywood.



**CEDRELA ODORATA**



The participants were given an overview of three key themes during the first lesson, which included the ecosystem products and services provided by forests, the operation of tropical dry forests, and forest dynamics such as succession and natural regeneration. Later, the students visited the interpretive ecological trail run by ELTI in the Achotines Forest Reserve's baseline forest to understand further the themes covered in the lectures. The visit involved studying diverse patterns, processes, and traits of the mature coastal dry forest at various demonstration sites. The discussion topics included how abiotic and biotic variables affect the forest's structure, how it differs from wet forests, and how it generates and controls ecosystem services.

After the field trip, the students returned to the classroom to analyze the information gathered in the field and present the various indicators, including diversity, carbon, soil/hydrological condition, wood volume, and the value of non-timber forest products (NTFPs). The session concluded with an open discussion of the day's events.

*The*  
**DAY THREE**  
*31st March, 2023*



**a**



**b**

Photo: Saskia Santamaria



**c**



**d**



**e**

**GALLERY**

- a. Coincidentally, one of the mixologists at La Baraca restaurant in Eco Venao Lodge is sporting an Arun-themed shirt.
- b. Participants discuss the mature coastal dry forest's patterns, processes and characteristics.
- c. The Owl Butterfly gets its name from the large eyespots on its wings, which resemble the eyes of an owl. It is a large butterfly with brown and orange wings often resting on tree trunks during the day.
- d. Lightning strikes can also start fires in trees and the surrounding area. When lightning strikes a tree, it can create heat that ignites its bark and branches, causing a fire to start. If the surrounding area is dry, the fire can spread quickly and become dangerous.
- e. Observing the natural decomposition of a hardwood tree stem in a natural forest is a slow but essential process that contributes to the health and sustainability of the forest ecosystem.

**LUZ I. LORÍA**

**THE UNIVERSITY OF PANAMA ·  
FACULTY OF AGRICULTURAL SCIENCES  
DOCTOR IN CONSERVATION**

As human activities continue to alter the natural habitats of primates, the overlap in resource use and conflict between primates and people is increasingly becoming common. The forest-farm edge is particularly vulnerable to this conflict as primates are known to feed on crops in these areas. For example, while anecdotal evidence suggests that the white-faced capuchin monkey (*Cebus imitator*) feeds on crops in Panama, there has yet to be a systematic investigation into farmers' perceptions of this behaviour.

To address this gap, we conducted free listing exercises with 37 farmers and in-depth interviews with 29 farmers in rural communities of Renacimiento District, Chiriquí Province, Panama, to assess their perceptions and attitudes towards crop-feeding by white-faced capuchins. We also set up 26 camera traps in five maize fields to capture crop-feeding behaviour.

# GUEST LECTURE - 1

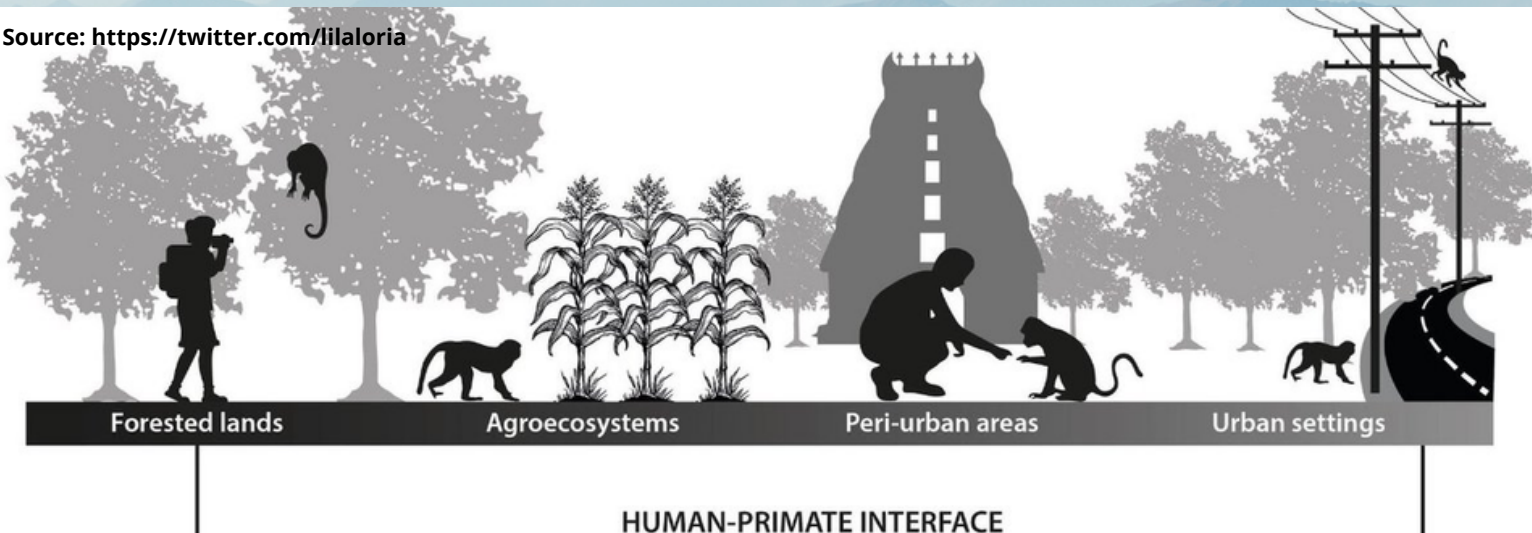
Our findings indicate that farmers perceive the white-faced capuchin as one of the primary crop feeders that cause crop damage. Although two-thirds of the farmers reported decreased crop-feeding by white-faced capuchins over the years, 70% still suffer significant crop damage due to their activities. The camera trap data revealed that the white-nosed coati was the most frequent crop feeder, while capuchins were identified in only two crop-feeding events.

Farmers identified several nonlethal techniques to deter white-faced capuchins, indicating their empathy towards the primates and their need to eat. They also acknowledged the impact of deforestation on wild food abundance, further highlighting the importance of human-primate coexistence.

Our study suggests that rural communities in Chiriquí Province, Panama, are receptive to conservation messaging that promotes coexistence between humans and capuchins.

***The aim of this study is to investigate the lifestyle and foraging patterns of the Panamanian white-faced capuchin monkey in agro-ecosystems, as well as to examine the attitudes and opinions of farmers towards this primate species.***

Source: <https://twitter.com/lilaloria>



Source: <https://twitter.com/lilaloria>



**JOSE VARGAS - FRBP**

## GUEST LECTURE-2

Since 2000, we have researched the endangered Harpy Eagle in Darien, where we founded the first non-governmental organization for raptor preservation in Panama. We were also involved in breeding and releasing Harpy Eagles and conducting public education and outreach programs in the country. Our research on wild populations of the Harpy Eagle continues to this day. In addition, we maintain close relationships with people across the country, which has provided us with a comprehensive understanding of the various challenges faced by the inhabitants of the Darien region. We are ready to work collaboratively to address the area's rapidly increasing threat of land development.

The Darien Gap, situated at the border of Panama and Colombia, is a vast expanse of rainforest that remains largely untouched and is considered the most significant and untamed region north of the Amazon. However, the area has been inhabited by indigenous peoples for thousands of years. It is home to a substantial population of **Harpy Eagles**, which nest in the towering trees of the forest.

Despite being similar in size to Connecticut, the Darien region boasts an impressive number of bird species, exceeding 500, with 54 belonging to the raptor category. In addition, the area is renowned for its high levels of biodiversity, with a fifth of its plant species being unique to the region and the possibility of discovering numerous other species. Therefore, the Darien region is considered a biodiversity "hotspot" and one of the most biologically diverse locations on the planet.

Almost three decades ago, we were pioneers in community-based conservation in Madagascar, also recognized as a biodiversity hotspot. To date, we have supported 11 communities in the region to establish sustainable management practices for local resources. We have also played an instrumental role in expanding the national protected areas in Madagascar by over a million acres and have contributed to the training and education of numerous individuals as conservation leaders. Our experience in "saving raptors and enriching lives" across various regions globally has provided us with a positive outlook for Darien's conservation efforts.

Source: <https://www.peregrinefund.org/projects/darien-conservation>



Photo: Saskia



A visit to Odielca's model farm.

## Model silvopastoral and agroforestry farm

On the fourth day, this course involved visiting Odielca Solís' model farm in Los Santos Province, Panama. Odielca Solís is a young, single mother who runs a cattle ranch with her cousin Edwin Ballesteros. She is also a founding member and acting secretary of the Association of Livestock and Agrosilvopastoral Producers of Pedasi (APASPE). She has co-facilitated ELTI's field courses for years, sharing her knowledge and experience from her successful agro-silvopastoral farm in Los Asientos. Odielca is committed to demonstrating sustainable ranching and agricultural systems in her community and hopes to inspire positive changes in ranching practices.

The aim of this project was to safeguard riparian areas on Odielca's farm and create a demonstration site that showcases economically-viable techniques for restoring forest cover. The rampant degradation of riparian areas caused by unrestricted cattle movement and inadequate tree coverage leads to stream pollution.

### Learning from the model

Compared to traditional ranching, managing silvopasture systems requires significant extra effort. For instance, the land needs to be divided into sections, and cows must be rotated frequently to prevent overgrazing in any one area. While this approach benefits her cattle and local wildlife, planting trees has created opposition from some farmers who question why one would plant trees on the land that ancestors worked hard to keep clear. At times, these practices have resulted in conflicts with old-timers.



Photo: Emily Le Rauzic

Jacob explaining the best practices for sowing seeds in nursery

Nevertheless, the potential benefits of this system have inspired Solís to continue her efforts. Planting trees and shrubs offers numerous advantages that increase meat production while benefiting the environment by enhancing wildlife habitat and sequestering carbon.

Although cows are typically blamed for contributing to the release of climate-warming gases, silvopasture systems' additional woody plants and improved soils globally pull an estimated 26 gigatons to 42 gigatons of carbon dioxide (as claimed on 29 April 2020 in an article in Mongabay) from the air before it contributes to climate change. In this way, the techniques that Solís and a new generation of farmers in her region are using could provide a solution for the considerable environmental impact of cattle ranching, even in a country where cattle reigns supreme.

### Learning Nursery management with soil preparation and planting saplings

A session was conducted on creating a small-scale community tree nursery after lunch. Before starting, emphasize that reforestation should always be a last resort when developing a forest restoration plan due to its intricacy and high cost in terms of time and resources. Jacob began by discussing the goals and site considerations for establishing nurseries. Next, participants built a seed germinator bed and learned about different seed types, storage, and scarification processes. After constructing & disinfecting the bed, the participants practised scarifying seeds and various planting techniques. They also learned about making substrates, mixing and filling bags, & ultimately transplanting seedlings from the germinator bed into prepared bags.

To conclude the nursery session, the importance of meticulously selecting tree species for reforestation projects is based on their ecological and social significance since they must perform well in degraded site conditions and have value for local communities. During his demonstration, Jacob showcased effective techniques for creating various reforestation plots and sizes. He utilized basic tools like a roll of twine and lightweight three-meter PVC tubes to measure planting distances in a fast and accurate manner precisely. Following this, Jacob talked about the most effective planting methods, emphasizing the importance of digging 40-centimetre holes to loosen compact soils and planting saplings with ample organic material or by utilizing helpful microorganisms from nearby forest soils. He also discussed post-planting upkeep, including fertilization, mulching with dry and wet organic matter or cardboard, and constructing mini-swales and barrier walls to catch sediment and water.



Following soil preparation, participants are preparing their bags for sapling planting.

Photo: Saskia Santamaria

# The DAY FOUR

1st April 2023  
GALLERY



- a. Inexpensive and practical drinker Made with readily available materials. Square cattle buoys are more durable and cost nearly the same as toilet buoys.
- b. A series of photos illustrating the different steps needed to plant a tree.
- c. d. The owner stressed the value of safeguarding the stream for maintaining dairy output as well as for providing a habitat for flora and fauna. Participants also learnt about the fundamentals of sustainable cow ranching, which include safeguarding water resources, increasing forest cover to reintegrate ecological processes into pastures, and rotating pastures to prevent overgrazing and soil compaction.
- e. A group photo with Odielca Solís' at her model farm in Los Santos Province, Panama.

Read article on Mongabay

• <https://news.mongabay.com/2020/04/in-panama-agroforestry-technique-of-silvopasture-improves-ranching-traditions/>



A visit to Dolores Soli's model farm.

### Model silvopastoral and agroforestry farm for rapid site assessment and restoration strategy exercise

Dolores Solís, a farmer in the Azuero Peninsula region of a Central American country where a tropical yet arid forest prevails, has implemented silvopastoral techniques that enhance food security, foster reforestation, and encourage the sustainable utilization of water and land. With 16 siblings ahead of him, he has developed a talent for seamless integration in 11.7 hectares of hilly pasture, which he applies to the management of his land, including cows, coffee, sugarcane, and plantains.

Water sources play a vital role for ranchers, but they often face degradation due to deforestation and unrestricted access by cattle to riparian areas. Thanks to the project's assistance, ranchers now have two cattle aqueducts, reserve tanks, and solar-powered pumps at their disposal to ensure a clean water supply.

Adopting water delivery systems is essential to curb cattle's unrestricted access to riparian areas and help conserve gallery forests and water sources. In addition, these systems enable the division of pastures into more productive intensive rotational systems.



Participants practicing short survey to propose strategies

### Participant presentation on Model farm exercise

During the final day of the course, the participants put their knowledge into practice by developing a farm management plan to implement ecological restoration strategies on an actual farm. They were taken on a tour of a conventional farm nearby and asked to conduct a farm diagnostic using a conceptual framework they had learned in the field. Divided into four groups representing varying objectives of potential property buyers, the participants developed restoration strategies that were suited to the farm's unique needs and constraints. Each group developed their strategy based on the buyer's objectives, such as timber, biodiversity, forest connectivity, and agricultural production, while considering the resiliency of the ecosystem, land use history, and surrounding landscape conditions. Additionally, they took into account the owner's objectives and the economic cost of implementing the strategy. This exercise challenged participants to consider technical and social information, baseline studies, and funding opportunities needed to develop an informed restoration strategy in each case. The farm owner was not present for some emergencies, and Jacob, the course instructor, assumed the owner's role by sharing his values and goals for the farm and providing feedback on the proposed strategies developed by the participants.



Participants presenting their proposed strategies

The participants actively learned about restoration strategies for cattle ranching landscapes throughout the course. They greatly appreciated the opportunity to receive practical training on forest restoration strategies, which are of high interest in their communities. Moreover, they were excited to apply the practices they observed on model farms and incorporate them into their restoration efforts. ELTI conducted this field course as part of its one-year program on Tropical Forest Landscapes: Conservation, Restoration & Sustainable Use, highlighting ELTI's reputation as a leader in forest restoration training.

The participants were given an overview of three key themes during the first lesson, which included the ecosystem products and services provided by forests, the operation of tropical dry forests, and forest dynamics such as succession and natural regeneration.

Later, the students visited the interpretive ecological trail run by ELTI in the Achotines Forest Reserve's baseline forest to understand further the themes covered in the lectures. The visit involved studying diverse patterns, processes, and traits of the mature coastal dry forest at various demonstration sites. The discussion topics included how abiotic and biotic variables affect the forest's structure, how it differs from wet forests, and how it generates and controls ecosystem services.

After the field trip, the students returned to the classroom to analyze the information gathered in the field and present the various indicators, including diversity, carbon, soil/hydrological condition, wood volume, and the value of non-timber forest products (NTFPs). The session concluded with an open discussion of the day's events.

The

DAY FIVE

2nd April, 2023

GALLERY



- a. A farmer from Los Asientos, Panama, named Mr. Dolores Solis, is a member of a group that is pushing the use of sustainable methods and improving the country's ranching industry.
- b. By combining the production of livestock and trees and forage shrubs, silvopastoral systems encourage mosaic land use. By combining various activities, such as planting trees and shrubs around crop and livestock harvesting, local requirements are met while the burden on natural forests is reduced.
- c. Created in 2011, APASPE is a local organization of environmental leaders dedicated to transforming the Panamanian ranching sector through the use of sustainable practices. Under the project, APASPE members were able to introduce important technical changes in livestock production, including silvopastoral farming.
- d. Noticed the cotton bolls with the protective case that surrounds the cotton seeds on the way to the main road.
- e. A photo on the farm

Photo: Saskia Santamaria

Read article on Mongabay

- <https://undp.shorthandstories.com/gef-sgp-harmonious-land/>



**Meeting with Hanily in La Strega (Italian cuisine):**

George has extensive knowledge of the country’s environmental, political, cultural, geographic and economic aspects and has a successful track record managing multiple projects simultaneously. His interdisciplinary experience and training permits an important role in the continued development of The Conservancy’s Panama program.

**Discussion:**

The economy of Panama is a highly developed and service-based economy, with services accounting for around 80% of the country’s GDP. The Panama Canal, a major international shipping route, is crucial to the country’s economy, generating significant revenue through tolls and related services. The financial sector is also a significant contributor to the economy, with Panama City being a regional hub for international banking and finance. Additionally, tourism, logistics, and the Colon Free Trade Zone are major contributors to the economy. Panama’s economy was facing several challenges and threats, such as Panama faces competition from other countries in the region, particularly in terms of attracting foreign investment and tourism.

**George Hanily**

Also, the major threats to Panama’s forests include deforestation, agricultural expansion, mining, and illegal logging. In recent years, several controversial mining projects have been proposed in Panama, including the Cobre Panama copper mine, which began production in 2019, and the Petaquilla gold mine, which has faced significant opposition from local communities and environmental groups. The country will likely continue to explore the potential of its mineral resources. Still, it will also need to balance this with a commitment to environmental sustainability and social responsibility.

However, the country has lost a significant portion of its forest cover over the past few decades, with estimates suggesting that it lost around 29% between 1990 and 2020. Agriculture, particularly cattle ranching and palm oil plantations, is a leading cause of deforestation and a significant driver of greenhouse gas emissions. Mining activities, especially in indigenous territories, have also been a source of conflict and environmental degradation. Illegal logging and the wildlife trade are additional threats to Panama’s forests, leading to habitat loss, species decline, and the disruption of ecological processes. Climate change is also a growing threat, with rising temperatures, changing rainfall patterns, and extreme weather events posing challenges to forest conservation and management.

Addressing this issue will require a concerted effort by the government, farmers, and other stakeholders to promote sustainable land use practices



**Ceiba pentandra Gaertn**

Ceiba pentandra Gaertn is the scientific name for the Kapok tree, a tall and majestic tree found in tropical rainforests. It is known for its large size, with some specimens growing up to 200 feet (61 meters) tall, and its unique buttress roots that provide stability in wet soil. The tree produces seed pods filled with fluffy fibers that were traditionally used for stuffing pillows, mattresses, and life jackets. The Kapok tree also has cultural significance in many indigenous cultures, often being considered a sacred or spiritual tree.



Banita poses for a photo after being awarded her course certificates.



Participants pose for a group photo after being awarded their course certificates.



The  
DAY SIX



30th March, 2023

GALLERY



- a. Travel back to Panama City on the sixth day.
- b. La Strega (Italian Cuisine). Famous for very good Italian food. Al lado de financiera Pacifico, Panamá Calle 50 Entre la Av. Federico Boyd y, C. República de Uruguay, Panamá, Panama
- c. Chef carefully curates a selection of dishes featuring plant-based proteins and dishes incorporating meat responsibly and ethically.
- d. Elti team Congratulating all participants on successfully completing the course with the distribution of certificates to participants
- e. Participants enjoy the last day's dinner at La Strega in Panama City.



Arun Kashyap

## Reflection and Conclusion

I was eager to participate in the field course to gain a comprehensive understanding of agroecology and agroforestry projects by visiting farmers, communities, and organizations who are practically implementing these techniques on various landscapes in Panama. My goal was to learn about the traditional knowledge systems that farmers in this region rely on to make strategic decisions and choose viable options to restore ecological function and sustain agricultural production despite facing numerous political and socio-economic challenges.

The ELTI's Focal Training Sites located in the tropical dry forest of the Province of Los Santos in the Azuero Peninsula is, an excellent example of the diverse biophysical and socio-economic settings where various land uses are practised. These sites include the well-established tropical dry forest of the Achotines Forest Reserve, the IDB Forestal, which is a tree plantation of native species that allows for cattle grazing in the understory, and the privately-owned APASPE model farms, where members have implemented silvopastoral and agroforestry systems, home gardens, and riparian forest restoration. The Azuero Peninsula is Panama's cultural heart and soul, being the largest cattle-producing region in the country and serving as a centre for farming and ranching. In addition, its rolling hills and beautiful coastline make it a popular tourist destination. Over time, the peninsula has transformed from a verdant rainforest to a cattle country and a thriving travel spot.

However, the negative consequences of conventional cattle ranching practices are visible in the tropical dry forest of the Azuero Peninsula, which is one of the most endangered ecosystems in the South American biogeographic region. Deforestation and soil degradation have severely impacted the ecosystem's ability to provide essential services such as clean water and soil nutrition, which are necessary for supporting ranching and agricultural livelihoods. In addition, climate change-related extreme rainfall and drought exacerbate the problems associated with unsustainable land use practices, making ecosystem restoration challenging.

Despite these challenges, there have been advances in forest restoration and farming systems to enhance the production and provision of ecosystem services in cattle ranching landscapes. One of these good systems is silvopastoral farming, also known as agroforestry. This method involves combining woodlands and pastures in a mutually beneficial way. Silvopastoral systems have been used for centuries in temperate regions worldwide and involve integrating trees with forage and livestock production, potentially increasing agricultural production in the long term. Silvopastoral systems notably impact biodiversity, as they tend to increase it compared to pasture-only systems. In addition, including shrubs and trees in these systems provides greater cover and habitat for wild birds, mammals, and reptiles.

Moreover, the increased range of plants and soil fertility resulting from silvopastoral also enhances the presence of beneficial insects and invertebrates essential for farming. In the Province of Los Santos, most farmers combine silvopastoral with the production of food crops like corn, plantains, bananas, and yucca.

Silvopastoral systems encourage mosaic land use by incorporating trees, forage shrubs, and livestock production, which provide necessary goods for local needs while reducing pressure on natural forests. However, such practices have been mostly absent from the Panamanian landscape due to a demand for more information and incentives available to cattle ranchers. It is essential to bring about a profound and enduring transformation in the way farmers perceive and interact with their land. Leaders in silvopastoral must motivate and encourage others to replicate this change.

With Sincere Thanks

*Arun Kashyap*  
 FARMER, SOCIAL WORKER,  
 ENVIRONMENTALIST &  
 ACTIVIST