



INNOVATIONS FOR SUCCESSFUL SOCIETIES

FORESTS, FARMS, AND THE FUTURE OF THE LACANDON JUNGLE: PAYMENTS FOR ENVIRONMENTAL SERVICES IN MEXICO, 2007–2014

SYNOPSIS

In 2007, the tropical forests of Marqués de Comillas, a municipality in Mexico's Lacandon jungle, were disappearing rapidly. Poor farmers who had migrated to the region during the 1970s relied on clear-cutting the forest to open up land for agriculture, and they were cutting more and more trees every year. After 1997, the average deforestation rate accelerated to 4.8% per year from 2.7%. By 2005, only 35% of the municipality's forested area remained. In 2007, former environment minister Julia Carabias decided to take action. Carabias and her team at Natura Mexicana, a nongovernmental organization, joined with local communities to enroll participants in the National Forestry Commission's payments for environmental services (PES) program and find economic alternatives to clearing the forest for agricultural use. PES, which remunerated landholders who preserved their trees, immediately slowed deforestation in the areas where it was implemented. Natura Mexicana's work in environmental education, land planning, and ecotourism development helped change farmers' attitudes about the importance of protecting the rain forest.

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INTRODUCTION

In late 2009, Mexican president Felipe Calderón and former environment minister Julia Carabias looked down from a helicopter above the Lacandon jungle in the southern state of Chiapas. Below them was Mexico's largest tropical forest, an expanse covering more than 1 million hectares.¹ But natural beauty was not what drew their attention.

Carabias directed the president's gaze to Marqués de Comillas, a municipality just outside

the protected area of the rain forest. Instead of trees, they saw cropland and ranches carved out of the primary rain forest. Despite the devastation, Carabias pointed out some areas where forests remained. She knew those areas well as a result of her work with the nongovernmental organization (NGO) she had cofounded called Natura y Ecosistemas Mexicanos AC, known as Natura Mexicana.

Since 2007, Carabias and her staff had worked with local communities to protect the

remaining forest and improve local livelihoods. Their hard work in the volatile Lacandon region was starting to show signs of success, and Calderón had flown to Chiapas to see the fight against deforestation firsthand.

Carabias maintained that protecting the remaining area of the rainforest was vital for local farmers. The trees improved soil fertility by returning organic matter to the land. Further, trees helped reduce soil erosion and improved water quality by filtering out agricultural runoff and sediments.

The forest was also a national treasure. The most biodiverse region in Mexico, the Lacandon contained 25% of the total species of plants and animals in the country, including more than 1,500 different types of trees.² It was also an important source of carbon sequestration, meaning that its destruction affected not just Mexico but also countries worldwide facing the consequences of global climate change.

Five years after stepping down as environment minister—a post she held from 1994 until 2000—Carabias joined forces with Javier de la Maza, a biologist who had previously served as head of Mexico’s national parks. Together they founded *Natura Mexicana* in order to study and preserve the Lacandon ecosystem. Carabias and de la Maza based their operations at Chajul station, a research facility within the Montes Azules Biosphere Reserve, the 330,000-hectare protected area of the rain forest, which was the home of the *Lacandon*, an indigenous people.

From the station, Carabias and de la Maza witnessed firsthand the deforestation in the municipalities surrounding the reserve. Directly across the Lacantún River, nestled between the reserve and the Guatemalan border, was Marqués de Comillas. For more than 30 years, poor farmers had migrated from other regions in Mexico and cleared land in the municipality to graze cattle and grow maize, beans, and other crops. By 2005, just 35.4% of the forest cover in Marqués de Comillas remained, and the average deforestation rate had

accelerated to 4.8% per year from 2.3% prior to 1997.³

Carabias said Mexico’s new, nationwide payments for environmental services program, or PES, held promise as a way to encourage farmers to preserve tree cover. Launched in 2004 by the National Forestry Commission—part of the Ministry of the Environment—the program aimed to conserve Mexico’s dwindling forest resources. PES was a policy that had been pioneered by Costa Rica in the 1990s to compensate Costa Rican forest owners for the environmental services their forests provided. The idea behind the policy was that everyone who benefited from the forests’ water services, carbon sequestration, biodiversity conservation, and scenic beauty should pay for the value the forests provided them. In Mexico, a portion of fees paid by water users together with an allocation from the national budget funded the PES program. PES could potentially make it economically feasible for farmers in the Lacandon to preserve the remaining forests on their lands.

Seventy to 80 percent of Mexico’s forests were located in *ejidos*, small communities with collective rights to specific areas of land (see text box). *Ejidos* represented a form of communal ownership specific to Mexico, and they were usually divided into individual plots of 2 to 50 hectares. Each plot was distributed to an *ejidatario*, a landholding member of the community. Many *ejidos* also reserved a portion of land for communal use.

Marqués de Comillas had approximately 8,500 inhabitants living in 27 *ejidos* on nearly 100,000 hectares.⁴ Just two of those *ejidos* received payments for environmental services. *Ejidatarios* were slow to join the PES program because many had not heard of it, others did not trust the government’s intentions, and some wanted to deforest because they perceived other land uses—such as agriculture or cattle ranching—as being more profitable.

While Carabias saw flaws in the PES program that limited its success in the region, she believed the program was a potentially useful tool in the fight to preserve the Lacandon for future generations. She began to experiment with ways to convince ejidatarios to conserve.

THE CHALLENGE

Carabias was well aware of the roadblocks she would encounter in preserving the Lacandon rain forest.

Like much of Chiapas, Marqués de Comillas was the home of some of the poorest families in Mexico. In a study of four of the ejidos where Natura Mexicana worked, the average annual household income was just 42,750 pesos (about US\$3,400), less than a third of the national average.⁵ According to census data, 24% of the population was illiterate, and only 50% of households had running water.⁶

“[The Lacandon] is a place where we have political conflicts because of the guerrilla [movement], which is not active but is there. Indigenous people live in extreme poverty. There is a problem of land conflicts. And it’s a place with a huge amount of illicit activity . . . all kinds of indirect drivers of land-use change,” Carabias said.

The Lacandon had developed a reputation for being a dangerous area because of a 1994 uprising led by the Zapatista National Liberation Army—a guerrilla group fighting for the rights of marginalized populations in the region—against the Mexican government. The continued presence of the guerrillas, the extreme poverty of the people, and the power of organized-crime groups all contributed to local insecurity that encouraged ejidatarios to focus on the short-term benefits they could extract from their land.

Box 1. Ejidos in Mexico

Following the Mexican Revolution of 1910, the federal government created ejidos to distribute land to poor peasants in rural areas. Over about 75 years, several thousand ejidos were created throughout the country, with most *ejidatarios* (ejido members) using their individually allotted plots of ejido land for agriculture while sharing access to larger, common areas. Sometimes the ejidatarios collectively decided to divide up the common-use land into individual plots.

Every three years in each ejido, ejidatarios voted for a leader, known as the commissary, as well as a secretary and a treasurer. The three elected representatives collectively governed the ejido and presided over community assemblies held every one to three months. At the assemblies, ejidatarios made collective decisions on how to use communal land, assessed opportunities available to them, and addressed community concerns.

In 1992, the Mexican government halted the creation of new ejidos and established a two-step mechanism by which plots of ejido land could be converted to private property. The first step, in the form of the Certification Program for Ejido Rights and Titling of Urban Lots (Programa de Certificación de Derechos Ejidales y Titulación de Solares Urbanos, or PROCEDE), enabled ejidos to formalize titles for individual plots of land owned by members. Ejidatarios could then undertake a second step to convert their land into private property.

Legally, PROCEDE could be used only for productive land that was no longer forested. In practice, however, PROCEDE often provided ejidatarios with titles to forested property. Still, many land transactions were undertaken in a less formal manner, and many ejidatarios chose not to go through the PROCEDE process. Informal agreements often decided the ownership of individual plots, and ejidatarios could decide to lend land to one another or to outsiders on an informal basis. In some ejidos, community norms dictated that the agreements be discussed and approved at an assembly.

The overexploitation of land used for agriculture resulted in soil erosion, water shortages, and low productivity. Rafael Obregón of the National Biodiversity Commission, an agency within the environment ministry that also worked in Marqués de Comillas, said there was a standard life cycle for the land in the region: “First, [the ejidatarios] would cut down a section of forest. Then they would grow maize for a few years. When the productivity of the land declined, they would convert the crops to pasture for cattle. Once the cattle overgrazed the land, they would burn the pasture to eliminate weeds and renew the grass. Ten years later, the land would be completely degraded, and they would have to clear a new section of forest and start over.”

According to Abel Pérez, elected leader of the ejido Galacia, the ejidatarios themselves were beginning to recognize the negative consequences of cutting down trees. “We saw how deforestation was causing the water to retreat, and we understood we didn’t want that,” he said. “There was less rain, and the drought time increased.” Yet participation in the payments for environmental services (PES) program remained low.

In addition to the difficult circumstances that prevailed in the region, one possible reason for the low enrollment was the design of the system itself: The commission paid ejidos enrolled in the program just 300 to 400 pesos (approximately US\$25 to US\$35 at the time) for each hectare of land they conserved. Ejidatarios received the payments once per year, and each PES contract lasted for five years. But the payments were far less than an ejidatario could earn from farming.

Further, there was a potential flaw in the delivery method. National policy required that ejidos sign up using technical advisers as intermediaries because the forestry commission did not have the capacity to visit each individual ejido or landholder interested in applying. The technical advisers were private contractors who identified the land to be enrolled in the program, designed a management plan for the ejido to

effectively conserve the forest, assisted ejidos in compiling the documents necessary to complete their applications, and monitored ejidatarios’ participation for the duration of their five-year contract with the commission. The advisers received payments from the forestry commission and the ejidos for their services.

However, with no direct oversight by the forestry commission, some of the technical advisers took advantage of the program and the ejidatarios for their own financial gain. Santiago Izquierdo, a doctoral candidate at Oxford University who conducted research on PES in Marqués de Comillas, said some of the technical advisers who worked in the municipality were “fraudsters” who received payments from the ejido and then left the region.

Juan de los Santos, a PES analyst at the forestry commission’s Chiapas office, recalled a 2009 case in a different area of the state in which an adviser accepted money from five ejidos and then disappeared before completing what he was hired to do. “Five ejidos were not approved [for PES] because the technical adviser did not do his job. After receiving the financial benefit, he was supposed to submit a best-practices manual, but he did not complete this,” de los Santos said. The best-practices manual was a management plan that the forestry commission required the technical adviser to complete after one year of an ejido’s participation in the program. Because in this case the adviser had not submitted the manual, the ejidatarios had to hire a second adviser to complete the manual in order to receive their payments.

Similar experiences raised concern among ejidatarios and skepticism toward outside organizations and government programs. Alicia Mastretta-Yanes of Natura Mexicana said that when she first started working in the region she frequently heard the questions “Why should I trust an NGO?” and “Why should I trust the government in general?” Carabias had to build ejidatarios’ trust in Natura Mexicana and the

forestry commission in order to persuade ejidatarios join the PES program.

Policy volatility, too, contributed to mistrust and skepticism. When the ejidatarios first received rights to the forested land in the 1970s, the government policy was to promote agricultural growth by encouraging clear-cutting to expand productive land and by paying subsidies on agricultural goods such as maize or beef. The aim of the PES program was the opposite.

Many ejidatarios feared the worst about the policy change and were leery of the government's motivations. "They thought the government was trying to take their land because they weren't using it, because it had vegetation instead of productive systems," said Elisa Castro, a Natura Mexicana staff member.

FRAMING A RESPONSE

To reduce forest loss in the ejidos of the Lacandon rain forest, Natura Mexicana had to build trust with ejidatarios, find strategies to address poverty in the region, and design an anti-deforestation program specific to the local context.

Carabias said any solution to deforestation had to go beyond the national PES program. In addition to cash incentives, she said, any effective anti-deforestation program for the region had to include programs that would improve ejido governance, provide environmental education, and develop economic alternatives to agriculture.

The first major issue involved ensuring democratic and accountable governance within ejidos so that payments and projects to reduce deforestation were free from corruption. The forestry commission made payments to the ejido authorities rather than to individual ejidatarios but did not monitor what happened to the payments after their delivery to the elected leaders of the ejido. Carabias wanted to increase payment transparency so that individual ejidatarios could hold their leaders to account.

A second major aspect had to do with increasing ejidatarios' awareness of environmental

issues to ensure they understood the value of the forests they owned. "People don't like to cut trees," she said, "but they don't care that much about it either—except once they have the information and understand the importance of biodiversity . . . and the issues of climate change, and water. . . . Such awareness brings a new attitude."

The most essential element, however, was to ensure that the program provided sufficient economic benefit to alter behavior. "People can't eat democratic governance and awareness," Carabias said. "They need concrete [economic] options." In 2007, the annual per-hectare payment available to ejidatarios who enrolled in the PES program was 396 pesos (approximately US\$36 at the time). Carabias considered the payments insufficient, especially when compared with what ejidatarios could earn from growing crops. Natura Mexicana had to develop economic alternatives that would improve incomes without increasing deforestation.

Although the entire Lacandon region faced economic pressures to cut forestland, Carabias decided to focus her NGO's limited resources on a specific area. She chose Marqués de Comillas because of its proximity to the Chajul research station, which was her base when working in Chiapas. "Why in Marqués de Comillas? It was a logistical issue more or less. We could start working anywhere because all the tendencies were more or less the same, with one distinction: Marqués de Comillas was not an indigenous population," she said.

Chiapas had the highest indigenous population of any Mexican state, and many of the indigenous groups lived in or around the Montes Azules Biosphere Reserve. But across the river, in Marqués de Comillas, ejidos comprised mostly migrants from other parts of the country, who grouped together based on their state of origin. In one ejido, all of the ejidatarios were from the state of Michoacán; in another, they were from Veracruz; and in another, they were from

Guerrero. Some ejidos had residents from many different states.

Unlike the indigenous *Lacandon*, who had lived in the rain forest for centuries and tended to use its resources more sustainably, the migrant groups came to Marqués de Comillas with one goal in mind: to convert the forest into productive agricultural land. According to Obregón, who worked in Chiapas for the biodiversity commission, “The people from Marqués de Comillas did not know the rain forest before. They did not understand the ecosystem.”

In 2007, Carabias was juggling her work for Natura Mexicana along with her job as a professor in Mexico City. After serving as minister of the environment from 1994 until 2000, she returned to full-time work in the faculty of science at the National Autonomous University of Mexico (Universidad Nacional Autónoma de México, or UNAM), where she had taught since 1979. She told students in her natural resources class about her work in the Lacandon region and about the situation in Marqués de Comillas. The students asked her to take them there, and that summer she organized a group of 18 students to volunteer for Natura Mexicana at Chajul research station. She put everyone to work on her plan.

GETTING DOWN TO WORK

In July 2007, Carabias and her students arrived at the Chajul station with several goals, the most important of which were to build trust with the ejidatarios in Marqués de Comillas, explain the benefits of the PES program, persuade them that it made sense to conserve their forestland, and provide them with the technical assistance necessary to join the national program. The group also aimed to assist a former student of Carabias who worked at Natura Mexicana on projects to restore forests on riverbanks in several nearby ejidos and to teach environmental education at local schools.

Carabias’ idea was that enrolling the ejidos in the program would have an immediate impact on

deforestation rates and give her more time to craft long-term projects to preserve forests in Marqués de Comillas.

Building trust in the program

De la Maza, who had founded Natura Mexicana with Carabias, had 30 years of experience in undertaking research and conservation projects from Chajul station. Across the Lacantún River from the station was the ejido of Boca de Chajul. De la Maza and others working in the area employed several inhabitants of Boca de Chajul and neighboring ejidos to provide basic services for the station.

In 2006, Paula Meli, a former student of Carabias, had begun working with those ejidos on a project to replant trees along streams. The communities had faced dry-season water shortages that some ejidatarios blamed on deforestation.

Natura Mexicana established some credibility by organizing funding from the National Commission of Natural Protected Areas to buy fences and plants and make small payments to the ejidatarios who participated. “Getting involved with the communities in this way may have been crucial, because they already knew us from a ‘helping to get resources’ perspective,” said Mastretta-Yanes, who worked on the project. “They knew we were serious and not going to run away with the money.”

The first people whom Natura Mexicana’s staff and volunteers approached about PES were the ejidatarios from Boca de Chajul who staffed the station. According to Natura Mexicana staff member Castro, some of the ejidatarios had been working at the station for more than a decade, and many had become acquainted with the volunteers who taught environmental education classes at Boca de Chajul’s schools.

The commissary, or elected leader, of the ejido, José Valdovinos, embraced the concept of PES early on. Mastretta-Yanes recalled that he was “a young commissary who agreed to

propose something radically different to the ejido.” Valdovinos presented the proposal for PES at a series of ejido assemblies, with Natura Mexicana staff present to answer questions. According to Mastretta-Yanes: “The first one lasted several hours and was considerably tense. . . . Some people left the room after saying they were not going to participate.”

Fiorella Ortiz, who became Natura Mexicana’s PES director, said many ejidatarios believed the program was a government plot to reclaim their land. “A lot of people thought that even if the payments did arrive, it would mean the government was paying for their land little by little and that the government would take it away in the end,” she said.

Many members of the ejido, however, had a more positive response. “In the end, 70 ejidatarios [out of 172] in Boca de Chajul participated in the first PES application,” Mastretta-Yanes said. “They were a combination of the poorest, the ones closest to Natura Mexicana, and those who just decided to give it a go or who seemed genuinely interested in conservation. Not all of them signed on during the first assembly, but they joined in the next few days after we had done the fieldwork on other ejidatarios’ land.” She added that community members could see that Natura Mexicana was committed once the students began the time-consuming work of walking through the ejidatarios’ land, delineating land boundaries, and noting the vegetation in different areas.

To enroll the ejidos in the program, Natura Mexicana staff members took on the role of technical advisers. They used information provided by ejidatarios as well as GPS equipment to map the ejido land, they compiled supporting documents such as property titles, and they submitted the information to the forestry commission’s Chiapas office in Tuxtla

Gutiérrez or one of the temporary field booths that the forestry commission opened during the application period each year.

The forestry commission required the signatures of the three elected officials of each ejido—the commissary, the secretary, and the treasurer—as well as the signatures or fingerprints of more than half of the ejidatarios in order to confirm they wanted to participate in the program. Forestry commission staff in Chiapas checked that applications fulfilled program requirements and then sent them to the commission’s head office in Guadalajara. There, staff members entered the information into a database and ranked the applicants according to several criteria. The process prioritized applications from areas with high deforestation risk, high poverty levels, and denser forests and applied other factors that the forestry commission’s technical committee deemed important. The forestry commission then accepted as many applicants as possible based on resources available to the program that year.

Carabias said her students did a better job than the previous technical advisers did, partly because the students had a different incentive structure: Because their motivation stemmed from environmental and academic concerns rather than financial reward, Natura Mexicana’s workers could prioritize the land they considered to be more important to conserve, and they could commit extensive time to the fieldwork. Outside advisers, on the other hand, were paid on the basis of how many hectares they enrolled in the program. As a result, many emphasized speedy outcomes and often neglected to visit specific plots to confirm the existence of reported vegetation.

Most of the technical advisers earned their incomes from fees charged to ejidos and the forestry commission, but Natura Mexicana’s technical advisers received annual salaries paid for

by the NGO's foundation support. They returned the technical adviser fees to the ejidos to fund projects that the ejidatarios themselves decided on. "In Boca de Chajul, they used the money for the secondary school," said Carabias. "They bought a camioneta [van] to pick up and drop off the students each day."

Scaling up

After their positive experience in Boca de Chajul, members of the Natura Mexicana team began expanding their program and services. They approached people in two other nearby ejidos—Playón de la Gloria and Galacia—where again, the best response was from ejidatarios who had worked with de la Maza. Then, Carabias was surprised to find another ejido much farther away that was interested in working with her team. "Javier [de la Maza] and I were in [Zamora] Pico do Oro, the municipal capital, for a meeting with the mayor, when one of the leaders from Quiringuicharo [another ejido in Marqués de Comillas] saw me and came to say hello." The man invited Carabias to visit Quiringuicharo the next day to talk about the program. "They told us they were interested," said Carabias. "So I went [back] with the students, and we did the fieldwork."

When she returned to Mexico City in August, Carabias realized how successful the summer had been and how scaling up the students' work could have an even greater impact. "I was absolutely surprised by the way the students were working, and I realized [the work] had big potential," she said.

At the time, all UNAM undergraduate students were required to complete 480 hours of social service to get their degrees. To make the work beneficial for her students and to take advantage of their cheap labor, Carabias registered Natura Mexicana as an organization through which students could complete their social service requirements. After the first group, Natura Mexicana also became able to give more support

to the students—for example, by providing food while they lived at Chajul station.

Funding for the purchase of provisions for volunteers and for payment of the NGO's other operating costs came from the Mexican Fund for the Conservation of Nature (a national conservation NGO), Pemex (Mexico's national oil company), and the Carlos Slim Foundation (an eponymous foundation funded by the telecommunications billionaire) in an alliance with the World Wildlife Fund (an international conservation NGO). Natura Mexicana also earned revenue by providing training courses for staffers from the Ministry of the Environment, supported by the United Nations Environment Programme. According to Carabias, Natura Mexicana's total operating budget "was about 10 million pesos [approximately \$750,000 in 2009] per year."

Thereafter, Carabias returned with about 30 students every January and July. She said she "picked the best students" and recommended them for full-time jobs at Natura Mexicana. Each year, the NGO hired approximately 15 students to work for the organization full-time.

As word spread among the ejidos and as Natura Mexicana's capacity increased, Carabias and her former students expanded their coverage of the Lacandon region. From 2008 to 2010, Natura Mexicana enrolled 10 of the 27 ejidos in Marqués de Comillas as well as one ejido in the neighboring municipality of Benemérito de las Américas.

Ensuring compliance

Effective follow-up was crucial. Forestry commission staff at the Chiapas office checked annually to make sure that enrolled land had not been deforested. Staff members analyzed satellite images, and if there was a problem with the images—such as clouds obscuring the forest—they visited the ejido to check the plot in person by using a GPS.

Ensuring that ejidos complied with the terms of their PES contracts turned out to be less

difficult than persuading them to join the program in the first place. The contract with the forestry commission stipulated that if even one ejidatario cut down forestland enrolled in the program, the contract with the ejido would be terminated. The stipulation was a major factor in ensuring contract compliance and self-monitoring within ejidos, according to Ortiz. “I think it was something that really weighed on them,” she said. “It would be [one individual’s] fault that the whole ejido got kicked out of the program. Even though it never happened, I think it was a very big issue for them.”

Ortiz said land sales represented the biggest source of noncompliance. “Sometimes it happened that people sold off their land, and the new owner didn’t care,” she said. “We had to do official work to remove them from the program and let the forestry commission know.”

Other difficulties involved ejidatarios who accidentally deforested land enrolled in the program, because boundaries between plots were not clearly marked. On the rare occasions that this happened, the forestry commission allowed the ejidos to alter their contracts by replacing the deforested land with other plots of forested land in the ejido. “It wasn’t encouraged by the national forestry commission, but the ejido could always change the [plot of land enrolled in the program] when it needed to,” Ortiz said.

Natura Mexicana remained committed to ensuring transparency in the payment process. Nuria Rubio, who took over from Ortiz as the NGO’s head of PES, said: “I cannot interfere in the way payments are made inside the ejido, but what I can do is go to the ejido assembly, explain how PES works, and tell how much they are supposed to be receiving.”

Rubio described an example of how this worked to ensure accountability in ejido governance. “In one of the ejidos where we work, some people were not receiving payments because the authorities at the time decided that they were not worthy of [such payments]. The ejido

commissary wanted me to communicate exclusively with him.” Instead, Rubio attended an ejido assembly to make sure the right information was reaching each ejidatario. From the data she had gathered while conducting fieldwork in the ejido, she generated a list of the amount of forested land each ejidatario had enrolled in the PES program. “I read the list aloud in the assembly, and it was clear for everybody,” she said. “Without confronting anyone directly, I achieved what I’d wanted, which was to make the information available for everyone . . . It empowered them to ask for their rights.”

Developing ecotourism as an economic alternative

When Carabias first started working in Marqués de Comillas, she began thinking about finding ways to make forest conservation more financially attractive for ejidatarios—especially beyond the limited time frames of PES contracts. Mastretta-Yanes recalled Carabias telling her in July 2007 that the PES contract “is for five years, but the commitment has to be for the long term.” Carabias said ecotourism was one way to produce an enduring revenue stream related to forest conservation that would not depend on government funding. Her goal was to create ecotourism operations that generated sufficient income to match the payments that ejidatarios received from the PES program.

Carabias chose to explore ecotourism first with the ejido Galacia, which was across the river from the Montes Azules Biosphere Reserve. Because of the area’s scenic beauty, Galacia seemed to be a suitable site for a luxury ecotourism lodge. Twenty-three ejidatarios in Galacia were interested in participating in the ecotourism project. Natura Mexicana courted donations from Banamex (Mexico’s second-largest bank) to pay for the lodge’s infrastructure. The United States Agency for International Development provided funding for 38 training courses for ejidatarios in such subjects as first aid, cooking, and ecology.

According to Violeta Valadez, head of ecotourism projects at Natura Mexicana: “When we started to work with them [ejidatarios in Galacia], it was a really difficult relationship. They had the feeling that all biologists who had come and started projects had not finished them. But when [the training courses] finished in 2010, they felt different and started to believe in the project.”

Natura Mexicana’s continued presence in the community and strict monitoring of resource allocation were important factors in building the ejidatarios’ confidence in the project. “There are many people that have come to the community, offered projects, procured funding, and then robbed them,” said Valadez. “The people have very little trust in outsiders that come to the community. The advantage that we have is that our boss [de la Maza] has worked in the area for so long.”

After construction delays due to difficulties in transporting building materials to the site, Galacia’s ecotourism lodge, Canto de la Selva, opened in May 2012. The luxury facility had 14 cabins and a large communal area with a restaurant and bar, and it charged visitors an all-inclusive fee of 1,770 pesos (about US\$115) per night.

Only ejidatarios with land enrolled in the PES program were permitted to participate in the ecotourism project, and the hotel employed only them and their family members. Profits from the hotel were divided equally among ejidatarios based on how many hectares an ejidatario had enrolled in the program. According to Valadez, “The idea was that they could earn income from the hotel profits equal to what they earned from the PES program.”

Natura Mexicana also worked with neighboring communities to develop ecotourism activities that followed the same model. In Flor de Marqués, Natura Mexicana organized funding from the giant US-based retailer Walmart to build a campsite that provided lodging for student

groups and tourists looking for a more rustic experience. In Playón de la Gloria, the NGO procured funding to build a facility where the ejidatarios could breed butterfly species with support from an environment ministry policy called *wildlife conservation units*, which Carabias had instituted in 1997 as minister. Tourists staying at the lodge in Galacia or the campsite in Flor de Marqués could pay an entry fee to visit the butterfly house, and artisans in Playón de la Gloria sold handicrafts on-site.

Developing other economic alternatives

It was not feasible for Natura Mexicana to establish ecotourism initiatives in all 10 of the ejidos in Marqués de Comillas where it worked. In other ejidos, the Mesoamerican Biological Corridor Project had more success in improving livelihoods while expanding forest conservation. Staff from the biological corridor project worked with ejidos to make existing agricultural land more profitable, with the goal of sparing other land from deforestation. In 2012, Natura Mexicana launched a land-planning initiative that complemented the biological corridor’s work by identifying the returns on different land uses and encouraging ejidatarios to consider both profitability and environmental sustainability when deciding on land uses.

The biological corridor was a World Bank–Global Environment Facility–funded project to preserve biodiversity in Mexico and Central America. In Mexico, the project received World Bank funding from 2001 to 2009, and as the internationally funded project ended, the National Commission for the Knowledge and Use of Biodiversity—a new agency within the environment ministry dedicated to protecting Mexico’s biodiversity—absorbed the Mexican part of the project.

The biodiversity commission received funding from the environment ministry, but to support its work in the Lacandon, the commission also targeted an unlikely partner: the Ministry of

Agriculture, which provided an annual contribution of 15 million pesos (about US\$1.2 million) for the project in 2008 and 2009. After 2010, the annual contribution rose to 26.5 million pesos (about US\$2.1 million). Using that funding, the biodiversity commission expanded the biological corridor's work in both Marqués de Comillas and the neighboring municipality of Maravilla Tenejapa.

In 2008, the biological corridor funded a broad study of land management practices in the region. "The first thing we did was to analyze the good and bad practices that people used and figure out why the good ones weren't the ones that prevailed," said Obregón, the head of the project. According to Obregón, the study revealed that "the main thing that provokes deforestation in Marqués is cattle ranching." But surprisingly, the study found that most ejidatarios did not own cattle to earn an income; they used the livestock as a form of savings. Obregón said ejidatarios kept cattle "even if the cost of maintaining them wasn't covered by their sale price." To reduce the incentive to keep cattle, biological corridor staffers taught ejidatarios basic financial practices, including how to open and manage bank accounts.

To tackle the deforestation and land degradation issues in the two municipalities, staff from the biodiversity commission met to draw up a solution. According to Obregón, the biodiversity commission designed the solution together with partner organizations, including Natura Mexicana, at the Chajul research station.

The commission's work focused on increasing the incomes of people in the region by intensifying agricultural production and training ejidatarios to produce a diverse range of products. The commission worked only with ejidatarios who conserved forests on part of their land, based on the idea that the ejidatarios were likely to preserve forest if they earned more income from improved production on existing cleared land.

Like Natura Mexicana, the biodiversity commission found that lack of trust was a barrier to implementation of a successful program. "We wanted to have a relationship based on trust with the ejidos," said Obregón. "As members of the public sector, we wanted to show them that if we agreed to do something, we were going to do it, so that they also would fulfill the agreement. . . . Our number one enemy was that there had been a long history of corruption."

Also like Natura Mexicana, the biodiversity commission found that the example it set with the first ejidatarios was crucial to building the levels of trust required to expand the program. "In our first year, 60% of the people who said they wanted to work with us backed out," Obregón said. "We continued working with the 40% who stayed. Once we finished, the other 60% realized we had fulfilled our word, and they wanted to start working with us. We told them to finish what had been established at the beginning, and then we could go back to working with them. In that way, we established a trusting environment."

Juan Baez, who worked for the biological corridor, said his team built trust through its continued presence in the ejidos and by holding ejidatarios accountable for their commitments. "At first, people were skeptical, but when we started to follow up on every peso we spent, and we continued to stick with agreements, there was a change," he said.

One of the biodiversity commission's biggest successes involved intensification of cattle production. Ranches in many parts of Marqués de Comillas could accommodate only one or two head of cattle per hectare because of poor soil, lack of capital, and poor management practices. The biodiversity commission helped farmers collectively invest in grinders for feed grain, and it introduced new management practices such as rotation of pastures. "Now, in Quiringuicharo, there are people who can produce 200 cattle on five hectares," Baez said in 2015.

In 2012, Natura Mexicana began working with agricultural producers to improve their land management practices and their incomes, with the goal of reducing land degradation and sparing more land for conservation. Castro, who became head of land planning at Natura Mexicana, met with ejidos already enrolled in the PES program to encourage them to undertake a land-planning strategy with the NGO. A year earlier, the forestry commission had introduced land planning as a priority criterion for the environmental services program, and Castro said the commission's move was a strong incentive for ejidatarios to participate in the project.

The land-planning initiative started with ejidos close to the Chajul station. Castro said the strategy was the culmination of three workshops with ejidatarios. "In the first one, we talk about problems. The second, we talk about solutions. And the third one, we talk about ways to get to the solutions," she said.

Castro said new farming activities introduced through the land-planning strategy improved productivity and profitability and reduced environmental degradation. As examples, she cited the introduction of tree plantations, the replacement of chemical fertilizers with ones made from the natural waste of cattle, and the linking of ejidatarios with the biodiversity commission's cattle intensification projects.

Expanding payments for environmental services

In 2009, the five-year contracts signed by ejidatarios promised them annual payments of approximately 400 pesos (US\$30 at the time) per hectare for conserving their forests. But at the same time, the Ministry of Agriculture offered subsidies of 350 pesos (US\$26) per head of cattle owned and 300 pesos (US\$23) for every hectare of maize grown. As a result, many ejidatarios deforested more land to get the greater economic returns generated by agricultural subsidies and farming income.

That year, the only people joining the PES program were those who had no plans to clear their land anyway, those who were committed to conservation, and those who saw that conserving the forest on some of their land would provide environmental benefits for the land they farmed.

Ortiz of Natura Mexicana remembered that an ejidatario in Galacia had told her at their first meeting: "I can get 20,000 pesos [US\$1,500] from one hectare of chiles planted on the riverside. . . . This is a joke!" Chiles grown on fertile land were lucrative crops, but even common crops grown on less-fertile land were more profitable per hectare than the PES program was—especially when they also earned state subsidies.

Natura Mexicana's land-planning study estimated that the annual net benefit of growing corn and beans was 1,260 to 5,420 pesos per hectare depending on soil quality, with an approximate return of 123 to 147 pesos for every 100 pesos invested. However, because of the time and money required to cut the forest and cultivate the crops, ejidatarios could dedicate only a few hectares of their property to such land use each year. They left the rest untouched until the cultivated land lost its fertility, and they bought cows to graze on the degraded land as a form of saving—at a return of up to 485 pesos per hectare, or 73 to 119 pesos per 100 pesos invested, depending on the number of cows, the amount of land they had, and the management techniques they used.⁷

Carabias was convinced that getting a higher return per hectare from the forest would incentivize ejidatarios to cut fewer trees for cattle and crop cultivation. Making use of her reputation in government and her credentials among environmentalists, she lobbied the Ministry of the Environment, the forestry commission, and congressional representatives to provide more funding for the PES program and to increase the amount paid per hectare.

In 2009, her efforts attracted the attention of President Calderón. Carabias accompanied the president and his family on a trip to the Lacandon region, and during a helicopter flight over the area, Carabias said, Calderón was struck by the magnitude of deforestation in Marqués de Comillas and the likelihood of continued destruction. “He said we have to strengthen the program, and he asked me what the main obstacle was,” Carabias recalled. “I said it was the amount we were paying.” Later that year, Calderón increased funding for the forestry commission’s PES program.

With that increased funding, the forestry commission launched a new program called the Special Program for the Lacandon Rain Forest, which was available only to the four municipalities surrounding the Montes Azules Biosphere Reserve: Marqués de Comillas, Benemérito de las Américas, Maravilla Tenejapa, and Ocosingo. The program offered annual per-hectare payments of 1,000 pesos (about US\$80 at the time) for conserving the forest.

According to de los Santos of the forestry commission’s Chiapas office, Carabias and the biodiversity commission played major roles in creating the new program. “People who had strong negotiating skills like Julia Carabias and people from the biodiversity commission . . . [it was] because of their efforts [that] the program began,” he said.

The increased payments meant that many ejidatarios who had shunned the program became willing to enroll their lands. Even though the payments still could not compete with the returns of the most-lucrative crops on the most-fertile land—such as chiles grown near the riverside—participation in the program was more lucrative than other land uses in less-fertile areas.

OVERCOMING OBSTACLES

Subsidies from the Ministry of Agriculture for cattle and crop production had been obstacles to reducing deforestation in Marqués de Comillas

since Natura Mexicana first began working there, but in 2008, a new agricultural subsidy from the state government in Tuxtla Gutiérrez created an even stronger incentive for ejidatarios to clear their land. That policy, together with heightened security fears following a certain incident in 2014, threatened the sustainability of Natura Mexicana’s initiatives.

State palm oil policy

In 2008, the Chiapas government launched a set of policies to encourage the production of biodiesel, a fuel that could be derived from the oil produced by African palm trees. The state’s Ministry of Rural Development created a new agency called the Institute for Productive Reconversion and Biofuels, which would support ejidatarios who wanted to be involved in biodiesel production. The agency identified more than 1 million hectares in Chiapas—including nearly the whole municipality of Marqués de Comillas⁸—that had potential for the cultivation of African palms. From 2008 to 2012, the institute distributed 4 million African palm seedlings at no charge to ejidatarios in Chiapas and paid them 1,000 pesos per hectare for clearing land to cultivate the trees.⁹

Although state policy dictated that ejidatarios were not permitted to cut down primary forest to plant the seedlings, that rule did not protect the Lacandon jungle from further deforestation. Some ejidatarios planted the seedlings on pastures and then cleared forested areas so they would still have enough pastureland for their cattle to feed.

From 2008 to 2012, growing African palm was an attractive option for ejidatarios who wanted to increase their incomes. In addition to the state subsidies, they were guaranteed a price for selling the palm oil to the state processing facility; and once the trees reached full growth, their oil could be extracted and sold every 15 days.

After 2012, the state subsidy program ended, leaving some ejidatarios with landholdings that were no longer profitable. According to Baez,

palm oil was not profitable without the state subsidies, because cultivation of the trees required the use of expensive fertilizer, and the oil was difficult to transport to the processor in Palenque, which was more than four hours away by truck.

Without the subsidies to support their investment, ejidatarios with small palm plantations abandoned their crops. The abandoned palm plantations were difficult to convert back to pastures or to use for other crops. The palm trees had deep roots and were hard to chop down, and some ejidatarios planted maize around the palm trees or abandoned their land altogether.

Security issues

Carabias and the Natura Mexicana team were aware of the indirect deforestation incentives that regional insecurity had caused. Ejidatarios were unlikely to become stewards of the land if they believed they and their families would not be able to realize the benefits in the future. Criminal activity in the area could put a household's investments at risk and tip the scales in favor of exploiting land for short-term gain instead of conserving.

In 2014, though, public safety problems had a more direct impact on Natura Mexicana's program. On an April morning, armed assailants entered Chajul station and awoke Carabias from her sleep. "We are from the Zapatista National Liberation Army, and we have orders to take you to our bosses!" they screamed at her, according to one news report that recounted the incident.¹⁰ The assailants kept the former minister for more than 36 hours before releasing her in an isolated area of the Lacandon jungle, from which she managed to return to the station.

Carabias's abduction followed a series of threats made against her and Natura Mexicana after they began working in the Lacandon region. Carabias said she believed her assailants had been hired by groups angry over her denouncement of an illegal scheme to appropriate land from the

Montes Azules Biosphere Reserve. Other groups had accused her of running an illegal wildlife-trafficking scheme, of exploiting communities to profit from tourism, and of expropriating land from ejidatarios.¹¹ In Marqués de Comillas, where Internet connectivity was rare and few residents had cellphones, the accusations and rumors spread by word of mouth made it difficult for Natura Mexicana to maintain the level of trust required to work with the ejidos in the municipality.

The kidnapping was a major setback to the organization. "We stopped going to Chajul for three months, and I was late getting forms to the forestry commission," said Rubio. "The payments were delayed, and the ejidatarios got very upset. The trust between us and them, on our side, was a bit broken. Trust is still an issue."

Carabias's kidnapping also affected the NGO's work with ecotourism. During the four months following the incident, no visitors came to the ecotourism projects in the ejidos. Valadez, director of ecotourism projects at Natura Mexicana, said tourists were afraid to visit the region after major news outlets across Mexico published news of the kidnapping.

In July 2014, Carabias made her first visit back to the station, arriving covertly via the river. Six months later, fears about insecurity in the region diminished, and visitors began returning to the ecotourism facilities.

ASSESSING RESULTS

From 2008 to 2013, Natura Mexicana enrolled over 14,000 hectares of ejido forest in Marqués de Comillas in the PES program. The land, much of which had been at risk of deforestation, was protected for five years—the time frame of the contracts signed with the forestry commission. Most ejidatarios who were accepted into the program in 2008 and 2009 renewed their contracts in 2013 and 2014. In 2014, the ejidos working with Natura Mexicana received payments for protecting 13,460 hectares of forest.

Fructuoso Neri, commissary of ejido Santa Rita, said the payments were a major factor in his decision to preserve the forest on his own land. He said that without the PES program, he would have had to cut down forest on some of his 50 hectares in order to make a living. “If the payments for conservation stopped, we would have to cut the forest for agriculture and to raise cattle,” he said. Neri also received support from the biological corridor to produce rubber and grow trees on cattle pastures owned separately by his wife.

Measuring the impact of the PES program on a larger scale was more difficult. A 2014 evaluation by researchers from the University of Wisconsin, Duke University, and Amherst College found that satellite images “were not accurate enough to provide reliable estimates of deforestation.” The research team cited a lack of regularly updated images, poor-quality images, and cloud cover that obscured image analysis as the main reasons for the low level of accuracy in deforestation estimates.¹² However, the team’s analysis of multiple studies suggested that “deforestation rates appear to have declined considerably in Mexico since 2000.”¹³

Sébastien Costedoat, a doctoral candidate at the Autonomous University of Barcelona in Spain, used satellite images from 2007 and 2013 to calculate that the average annual deforestation rate in Marqués de Comillas and the neighboring municipality of Benemérito de las Américas in those years was 6.75%.¹⁴ That figure was higher than the estimated annual deforestation rate in Marqués de Comillas from 1997 to 2005, which Miguel Castillo, a doctoral candidate at UNAM, calculated as 4.8%.¹⁵

However, Natura Mexicana found that deforestation rates in the ejidos where its staff provided technical support for PES contracts were much lower than the municipal average. In 2013, Natura Mexicana published a case study on four of the ejidos where the NGO worked: Boca de Chajul, Playón de la Gloria, Flor de Marqués, and

El Pirú. In Boca de Chajul, the first ejido to sign PES contracts with the support of Natura Mexicana in 2008, the deforestation rate sank to 0.52% for 2007–2010 from 2.63% during 2000–2007. In Playón de la Gloria, where ejidatarios also joined the program in 2008, deforestation decreased to 0.91% from 4.05% during the same time frame. Deforestation rates in Flor de Marqués and El Pirú, both of which joined the program in 2009, showed less impact, with a reduction to 1.3% from 1.65% in Flor de Marqués and a slight increase, to 1.82% from 1.7% in El Pirú.

By 2010, 15 of the 27 ejidos in Marqués de Comillas had enrolled in the PES program, up from just 2 in 2007, when Natura Mexicana began promoting the program in the municipality.¹⁶ All but one of the ejidos that signed five-year contracts in 2007 and 2008 renewed their commitments to the program when their contracts expired.¹⁷ San Lazaro, the one ejido that did not renew its contract, did not work with Natura Mexicana. Izquierdo, the Oxford University doctoral candidate, said the withdrawal reflected conflicts within the ejido.

One criticism of the PES program—that it often compensated landholders for conserving forests not at risk of deforestation—appeared to be at least partly accurate in the case of Marqués de Comillas. Survey data collected by Izquierdo found that 59% of ejidatarios in the municipality said they would not have deforested land enrolled in the program, whereas 41% said they would have converted some of their forests to agriculture or other uses.

From 2004 to 2013, the forestry commission accepted 3.4 million hectares into the program—more than 5% of Mexico’s total forested area. Data from the Organisation for Economic Co-operation and Development showed that Mexico’s national deforestation rate fell to 0.13% in the years 2005 to 2010 from 0.5% in the years 2000 to 2005. And researchers from the Union of Concerned Scientists, a US-based NGO, said the

PES program was “the most far-reaching and novel effort” to achieve that change¹⁸.

Stefano Pagiola, a PES expert at the World Bank, said part of the reason the PES program did not have a greater impact on deforestation rates was that it did not target very well the areas of highest deforestation risk. “If you look at [the forestry commission’s] prioritization criteria, deforestation risk is one of them,” he said. “But there are so many other criteria that are used, so the weight of deforestation risk is really low – it is less than 10% of the total. So many other things affect the prioritization, and the program ends up not targeting deforestation well.”

Another impact of the PES program and Natura Mexicana’s work was a shift in attitudes toward conservation in the region. According to Castro, the ejidatarios’ “way of looking at the rain forest has changed completely. They see now that it has value—and not only economic value. They see that the government is paying them to preserve it because it is important.”

Obregón of the biodiversity commission said the work of the Mesoamerican Biological Corridor had contributed to this change in perceptions. “When we began working in 2008 in the Lacandon jungle . . . people didn’t value forest resources because [forest resources] didn’t provide them with economic benefits,” he said. “However, I believe we have changed that. We have changed the views that people have.”

Despite the trust Natura Mexicana cultivated in the ejidos of Marqués de Comillas, in 2015 many ejidatarios remained unwilling to trust the NGO and the government program it promoted. “Even now, some people think it is a government invasion,” Neri said. In his ejido, Santa Rita, 23 of the 43 ejidatarios participated in the PES program. Neri said the ones that did not enroll in the program maintained that “the government is going to take away their land.”

Adalberto Vargas, director of PES at the Chiapas office of the forestry commission, recognized the importance of Natura Mexicana

and of NGOs in general in the success of the program. “In Marqués de Comillas, we need an organization with experience and a permanent presence in the region,” he stressed. “The key indicator for success for the [forestry commission] is for ejidatarios to comply with their commitments to the program. But we have to go deeper than that, and the [forestry commission] isn’t able to do that. We have seen a lot more success when we have NGO support for the program, because NGOs can help ejidatarios to own their involvement in the program and they then become more motivated” to conserve the forest.

Despite the success of the PES program in Mexico since 2004, the government decided to reduce funding to the program in 2014 as part of a series of national budget cuts because falling global oil prices depressed state revenues. “There was a radical budget reduction in 2014. We had US\$120 million per year, and now it is down to US\$50 million,” said de los Santos of the forestry commission.

REFLECTIONS

The experience of Marqués de Comillas highlighted some of the conditions that scholars considered likely to affect protection of common-pool resources such as forests or fisheries. The *ejidos* that achieved better conservation of their communally owned forests were small and culturally homogeneous (being composed of migrants from the same origin state in Mexico). Greater levels of community participation in the decision-making process and concomitantly higher levels of peer pressure also encouraged compliance within the program.

Julia Carabias of Natura Mexicana noted that the ejidos that declined to work with her NGO and participate in the PES program were ones that had more-diverse populations and lower rates of attendance at community assemblies and ones whose lands changed hands more frequently.

In 2015, the sustainability of reduced deforestation rates was uncertain because of a shift in the primary cause of deforestation in the region. Rafael Obregón of the biodiversity commission said: “People from outside are now coming and buying land because they have a business idea like African palm plantations or the establishment of new cattle ranches. An entrepreneur might come and buy 100 hectares and deforest the whole property to plant African palm.”

Obregón said the shifting basis for deforestation reflected changing norms of the structure and governance of ejidos. “According to the law, ejido land should not be sold. However, what the law says and the internal dynamics of the ejidos are two totally different things,” he said. “Before, the decision to sell used to be made at the community level. However, the practice nowadays is for one individual to approach an ejidatario to buy the land and they just make the decision themselves.” If the trend continued, then the presence and the level of trust built by Natura Mexicana were unlikely to be as useful in continuing to reduce deforestation in Marqués de Comillas.

In 2015, Carabias was still lobbying the Mexican government to commit more resources to

environmental conservation and reduce the agricultural subsidies that encouraged ejidatarios to convert forests into cropland and pastures.

Carabias said that Natura Mexicana’s work could serve as a “model of intervention” to be replicated in other areas of the Lacandon jungle and other regions of Mexico. “I believe that we can, in Mexico, in Mexico, select 13 to 15 regions, [and] if we have success in correctly managing those regions, we could protect most of the biodiversity and environmental services in Mexico,” she said.

Although the PES program was expanded during the presidency of Felipe Calderón, who visited Marqués de Comillas in 2010 and approved the Special Program for the Lacandon Rain Forest, the following administration slashed the program’s funding by more than half. Such funding volatility illustrated the vulnerability of PES programs financed by national budgets.

In 2015, ejidatarios throughout Marqués de Comillas feared that the government might cut the program altogether, and Natura Mexicana staff members lamented the effect that the change in government had had on preserving Mexico’s forests. “In the current government’s agenda, environmental issues are not a priority,” said Elisa Castro of Natura Mexicana.

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