

## Market-based Strategies for Forest Conservation, Yoro Honduras, 9-16 March, 2020

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This is an account of findings during a trip to Yoro, Honduras from March 9<sup>th</sup> - 16<sup>th</sup>. The goal of the trip was to advance forest conservation through outreach and applied research. Deforestation resulting from the use of wood to dry coffee and the conversion of native forest for coffee cultivation is rapidly making rural communities in Yoro unlivable as water supplies dwindle because of reduced watershed capacity caused by forest loss and degradation.



*Continuing coffee expansion within the Buffer Zone of the Pico Pijol National Park threatens water supplies for surrounding municipalities.*

This is compounded with the lack of employment opportunities and volatility in coffee prices and processing costs that impose further hardships.

Our team is engaged in refining, validating and implementing at scale a market-based framework for forest conservation based on alternative coffee processing and production systems, collectively known as “The Yoro Model”. It consists of the following core elements: 1) The patented solar-biomass hybrid coffee driers designed by the Mesoamerican Development Institute (MDI), which eliminate the use of fuelwood used by conventional dryers that consumes the equivalent of 6,509 ha of forest annually, and 2) The Integrated Open Canopy (IOC) coffee cultivation system that conserves an area of forest on the farmer’s land equal to or greater than the area planted in coffee. Farmers are

compensated through carbon sales and ecosystem services from forests that promote higher coffee yields, including pollination from native bees and avian control of insect pests. Reduced energy costs from renewable energy translate into significant savings, and enhance the value of carbon from forest conserved on IOC farms. The income from carbon sales will be guaranteed for the duration of each carbon transaction, providing a buffer against crop failure or price volatility for small holders, as well as sustained forest protection.

I was accompanied by Dr. Caroline (Caz) Taylor of Tulane University. The specific objectives of this trip included: 1) Meet with municipal governments to describe our market-based framework for forest conservation and its contribution to ecosystem services, including watershed protection, and 2) Accompany Dr. Taylor’s doctoral student Fabiola Rodriguez and members of the MDI research team in the field to gain a greater appreciation of their research, and provide input as needed. This trip was facilitated by our collaborators Raul Raudales and Richard Trubey from the Mesoamerican Development Institute (MDI).

### Meetings with municipal governments

On the first day in Yoro we were met by City of Yoro Municipal Manager Rony Martinez and his staff at the municipal building in Honduras.



*Rony Martinez, Municipal Manager for the city of Yoro, describes challenges to watershed protection and strategies for addressing them.*

We accompanied Mr. Martinez and his staff to the impoundment on the Machigua River, which is the source of water for the City of Yoro. Like most municipalities in the region, Yoro is experiencing diminishing water supplies and increased contamination as the result of damage to watersheds from deforestation and forest degradation, and has recently declared a state of emergency due to water shortages. We discussed the importance of forest conservation to water quality and yield, and toured a tree nursery where we learned about efforts to reforest key parts of the watershed.

That afternoon we met with the Mayor of the City of Yoro Diana Urbina, the officials who took us on our tour of the watershed, and representatives of National Institute of Forest Conservation and Development (ICF).



*Our team with the Mayor of the City of Yoro Diana Urbina Soto (third from left).*

Dr. Taylor presented a potential market-based framework for forest conservation (the “Yoro Model”). Dr. Taylor is leading our team in an effort to model the interaction between coffee yield and ecosystem services as they pertain to forest conservation to refine and validate the model. This will help facilitate its eventual adoption across the newly established 12,000 km<sup>2</sup> Yoro Biological Corridor (YBC) via the administrative framework provided by a co-management agreement. The Mayor has joined the leaders of other municipalities within the YBC in signing a letter expressing their interest and support for this effort. One key component of the project is the creation of watershed models that will help prioritize areas for forest conservation within these watersheds to best enhance water quality and yield.

Later during our trip we had a lengthy meeting with representatives of the nearby communities of Buena Vista and Tegucigalpa. These small towns are also experiencing diminished water supplies as the result of deforestation, and who are also interested in the Yoro Model as a potential means for protecting their water supplies.



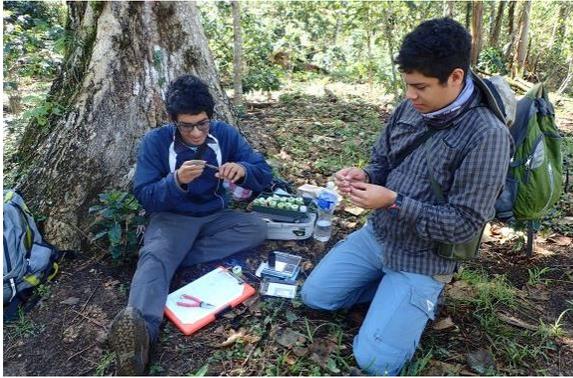
*Representatives from Buena Vista and Tegucigalpa and members of our team discuss options for watershed protection through forest conservation on private lands.*

MDI researcher David Murillo presented an overview of the Yoro Model, and then fellow team member Martin Murillo described the relationship between forest conservation and water quality, emphasizing the Rio Jacagua watershed, the source of water for both these towns. A round table discussion followed, where again it was observed that much of the deforestation taking place within the watershed, including nationally protected lands of the Pico Pijol National Park, is due to large, politically-connected commercial interests resistant to regulation. For this reason, alternative forest conservation strategies such as IOC can potentially supplement forest conservation on adjacent private lands.

### **Field research and training**

We spent several days at our field station where we have been conducting research on winter habitat requirements of Neotropical migrants since 2011. We were accompanied in the field by Fabiola’s field team, which included Denis Velasquez, David Murillo, and Dario Alvarado. The procedures include performing mark-resight of Wood Thrush and

Wilson's Warblers, two declining Neotropical migrant bird species, in order to estimate habitat-specific survival rates, and capturing Neotropical migrant birds in mist-nets to measure age, sex and body condition as metrics of habitat quality.



*David Murillo and Dario Alvarado processing songbirds captured during mist-net sampling.*

Bird captures also yield fecal samples that will be analyzed for DNA of the coffee-borer beetle to determine the extent to which birds depredate larva of this important insect pest, and whether this ecosystem service is related to the presence of conserved forest, as has been reported in other studies.

Evenings included impromptu workshops by Dr. Taylor and Fabiola on topics such as Bayesian inference estimates of survival rates from mark-recapture data in the open-source statistical program "R".



*PhD candidate Fabiola Rodriguez and Dr. Taylor present a workshop on use of the statistical program R.*

During a workshop on March 15<sup>th</sup> Maira Manzanares introduced the producer group Birding Coffee S.A., a key local partner. Allan Santamaria described efforts to assure coffee quality, critical to engaging international markets. Skarleth Gutierrez, the daughter of a local coffee farmer now studying economics at UNAH, presented her plans to investigate the economics of IOC farms and the value of its biodiversity. MDI associate Don Augustin Acosta related his outreach work throughout the region. Dr. Taylor presented the Yoro Model framework. Fabiola described her research on demography of Neotropical migrants along gradients of agricultural intensification. Dario Alvarado described his examination of bird body condition along this same gradient. Denis Velasquez, the longest-standing member of the team, described the technical skills he has acquired during his eight years of working with MDI.



*Kelly Diaz and Martin Murrillo discuss the importance of forests to water quality.*

David Murillo described his work assessing pest control by birds and the presence of forest-dependent birds among the coffee production systems. Farlem España reported similar numbers of forest-dependent bat and small mammal distribution in IOC forest patches and mature forest. Martin Murillo and Kelly Diaz presented their findings on water quality and forest conservation in the Rio Jacagua watershed. Finally, Raúl Raudales from MDI summarized progress they have made with their partners in the "Dirección de Biodiversidad (DIBIO)" of the Ministry of Environment and Natural Resources (SERNA) toward the legal incorporation of the Yoro Biological Corridor.

## Summary

Overall, the outcomes of the trip were highly satisfactory. Dr. Taylor was able to gain a greater appreciation of this important project, and to witness in person the field procedures her doctoral student Fabiola Rodriguez was employing. We were made aware of potential opportunities for watershed protection through direct land purchases for municipalities. These lands would be owned by cities and towns and protected through existing regulations and legal frameworks. Since our research has shown forests in this area are occupied by priority Neotropical migratory birds, including wood thrushes and golden-winged warblers, funding for these efforts could be derived from funding sources for bird habitat, as well as funding sources directed at international aid. The accomplishments of the research team were impressive, with much of the work confirming findings from prior research in Costa Rica that IOC coffee supports forest-dependent bird species not found in shade coffee, and that IOC supports similar numbers of forest-dependent bird, bat and small mammal species as forest. Finally, and perhaps most importantly, we were able to share our continued engagement in this project with representatives of local municipalities, who express support for our work and are able to influence land use policy and enforce conservation decisions, and our in-county collaborators, who are key to the continued development and eventual implementation of this important initiative.

## Future plans and prospects

Future goals include activities directed at forest conservation at both local and regional scales: 1) Generating funds for continued support of the research team, who otherwise will be forced to disperse in search of employment in another field 2) The continued refinement and validation of the Yoro Model 3) Undertaking a formal validation of the carbon standard from IOC farms so it can be sold on the open market 4) Collaborating with municipalities to conserve forest for watershed protection and wintering

habitat for Neotropical birds 5) completing the administrative task required for the establishment of the Yoro Biological Corridor And 6) scaling the Yoro Model up across the entire 12,000 km<sup>2</sup> Yoro Biological Corridor.



*A typical mixed-use landscape in which forest patches protect water quality and forest-dependent bird and bat species, with the Pico Pijol Park in the distance.*

These accomplishments will improve the resiliency of these rural communities for people, and also contribute key wintering habitat to help stem the ongoing population declines of many species of Neotropical migratory birds. This pilot project has been operating for seven years, during which we have refined the model and developed relationships with federal, state and local governments and agencies interested in stemming rural poverty and enhancing watershed and biodiversity protection. This network of collaborators will ensure that as financial support becomes available we will be positioned to make rapid progress towards scaling this project up to benefit rural populations through forest conservation throughout the coffee growing regions of Honduras and beyond. This project is currently operating with support from a variety of sources including US Federal research and conservation agencies, NGOs, universities, private foundations, research granting agencies, international aid agencies, and private businesses and financial institutions. We welcome new partnerships to leverage these investments to create sustainable working landscapes that sustain both biodiversity and rural livelihoods.