

Climate change meets the land-sparing/sharing debate: a study of droughts and land-use segregation in the Southern Yucatan, Mexico ¹

Overview

Precipitation in the Southern Yucatan is characteristically irregular, which manifests in frequent droughts that affect both natural and social systems. Despite its natural variability, the region may be experiencing the harshest drought of the last 30 years according to my own climatological analysis and supported by the perception of local residents. Considering the strong reliance in consistent rainfall by livelihoods in the region, I originally intended to investigate the influence of droughts as a driver of land-use and livelihood change. However, I quickly noticed the major role played by institutional and economic forces in such changes, greatly overriding the climatic factor. Across the four communities (*ejidos*) I visited in this initial phase of fieldwork, I witnessed a widespread change in land-use patterns from those reported in previous studies. I found local agriculture to be undergoing a process of intensification in which the traditional slash-and-burn system has been incorporating modern practices (e.g. mechanization) and becoming more sedentary. Besides household-level factors, smallholders modernize and sedentarize their traditional "*milpa*" partly due to agrarian programs that subsidize mechanization and agrochemical inputs, and partly due to conservation instruments that restrict forest clearing and field rotations. In my interpretation, the landscape of the southern Yucatan is currently experiencing a regime shift, in which a formerly heterogeneous and dynamic land-use mosaic is being replaced by one that is more stable, where conservation areas are increasingly segregated from agricultural lands. A new questions arises: how does a segregated landscape exacerbates (or not) the vulnerability of rural livelihoods to drought?

Fieldwork experience

I spent ten weeks (last week of May – mid August 2017) in the municipality of Calakmul, state of Campeche, Mexico. I set up my headquarters in the small town of Zoh Laguna, once the center of operations of a now-extinct logging company that exploited Calakmul's forests in the 1960s and 1970s. The legacy of the company can still be appreciated today in the colorful board houses and the nostalgic memories of Zoh Laguna's residents. With the assistance of colleagues at ECOSUR-Chetumal research center, I got introduced to the area and to some smallholders of two *ejidos* (La Guadalupe and Nuevo Becal). At first I had few contacts, but I began to extend my network throughout these *ejidos* and an additional two (Narciso Mendoza and Nueva Vida). My purpose in this first stage was, on one hand, to become a familiar face to smallholders and their families, and on the other, to recruit participants for an unstructured interview that probed their perceptions and experiences of drought, agricultural and beekeeping practices, and the economic and political context of agriculture and conservation efforts in the region. Interviews would include a visit to each farmer's field, which meant joining them in their morning walk to their "*trabajadero*". These visits proved crucial as I began to learn how drought might affect each smallholder differently based on how they choose to manage their fields, thus developing my preliminary understanding of the ways land-use decisions determine farmers' sensitivity and capacity to respond to this climatic event.

Land-use decisions in Calakmul are strongly influenced by broader institutions that seek to define the types and forms of livelihoods of local residents. One of these institutions, the municipality, is in constant search of ways to develop the region, most of them based on the modernization of traditional activities or the promotion of more profitable ones (like cattle grazing). The municipality relies mostly on federal funds to implement their programs, including some intended for poverty alleviation. Other major institutions with contrasting views on how development in the region should look, are embodied

¹ The title of my original proposal has been changed to better capture the processes that I have witnessed in the field. The previous title was "Drought in the New Rurality: Linking Livelihoods and Landscapes under Climate Change"

by conservation organizations such as the Calakmul Biosphere Reserve (REBICA), the National Forestry Commission (CONAFOR), and the Federal Attorney's Office for Environmental Protection (PROFEPA). These agencies both promote the preservation of forest-cover through programs such as Payment for Ecosystem Services (PES), and discourage clearing of old-growth forest via penalties and prosecution. To understand how these institutions interact with smallholders' land-use practices, I attended two meetings of the Rural Development Committee (chaired by the municipality) and one meeting of the REBICA Advisors Committee. In addition, I conducted interviews with two key informants, the Director of the REBICA and the president of a local NGO.

In the ten weeks I spent in Calakmul, funds granted by CLAG paid for daily transportation from Zoh Laguna to the *ejidos* (i.e. gas for my vehicle: \$420), ground transportation to arrive and leave the study area (\$180), two trips to Chetumal to meet with colleagues at ECOSUR research center (\$90), a round flight ticket (\$553), meals (\$180), and lodging (\$90).

Next steps

I am currently writing this report from Zoh Laguna, where I have been conducting the second stage of my fieldwork since mid-September. With the highly influential first-hand experience and valuable insights I gained thanks to my CLAG field award, I designed a semi-structured interview aimed at understanding the field- and household-level determinants of agricultural intensification in the region. For example, although land tenure seems central, its relation with intensification is not unidirectional. The certainty of having a permanent land holding determines in many instances the mechanization of a field, but in other cases, land holdings with forest makes the owner eligible for compensations (i.e. PES) that, together with other government transfer funds, discourage farmers from investing in inherently risky agricultural activities and compels them to abandon their fields. The expectation of a secondary forest becoming eligible to enter the PES program may further strengthen this behavior. Meanwhile, landless residents who rent or borrow land are not eligible for these programs and they have little to no support from the government. Although they can rarely afford mechanization, they seem to be discarding or at least shortening fallow periods of the fields they use. This sedentarization has made them highly dependent on other inputs to keep up with the inevitable nutrients loss and weed infestation. It becomes clear that with both a shortage of funds to pay for these inputs and a shortage of rainfall, landless residents may be those experiencing the worst consequences of these changes in climate and in the land-use regime of the region.

Besides agriculture, beekeeping represents one of the most common livelihoods in Calakmul, and many assert the most profitable. Beekeeping is also highly dependent on consistent rainfall, which controls the flowering of local vegetation. Many smallholders believe placing beehives in a mixed land-use mosaic rather than in old-growth forest may better buffer them from drought effects, as foraging options are more diverse. I will explore these assumptions by combining information collected by the Municipal Beekeeping Committee with processed satellite imagery.

The transition that the landscape of Southern Yucatan is going through, from a regime where conservation and agricultural lands essentially share the same space to one where both are strictly segregated, resembles a shift from what scholars refer to as a *land-sharing* to a *land-sparing* approach in land-use. Extensive research has elucidated the benefits and costs of each approach, especially in terms of biodiversity conservation. However, few studies have investigated the implications of each approach for local livelihoods, even less in the face of climatic change. I expect my doctoral dissertation to provide empirical evidence on the trade-offs and synergies of this land-use regime shift under drought conditions. Meanwhile, I hope my findings will be used to inform policy-makers and local stakeholders in the design of adaptation strategies appropriate to the local context of the Southern Yucatan. As I stress in all my interviews, upon completion of the project all results will be shared in the *ejidos* where I have been conducting my research as well as relevant local forums.

I finish by thanking CLAG for the significant support they provided me. Without the financial support, my crucial preliminary fieldwork would have been impossible.

Photo appendix



A dry “jagüey”: evidence of the prolonged drought.



Traditional slash-and-burn vs...



... a mechanized field: in its more extreme version, stubs and roots are removed with heavy machinery. Notice the substantive amount of topsoil displaced at the edge of the field.



Interview with a farmer.



Interview with beekeepers.



Zoh Laguna.