Borders in Globalization Review
Volume 3, Issue 2 (Spring & Summer 2022): 38–52
https://doi.org/10.18357/bigr32202220358

ARTICLE
SPECIAL SECTION

The Border-Development-Climate Change Nexus: Precarious Campesinos at the Selva Maya Mexico–Guatemala Border

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Borderlands can be places of socio-economic tensions, development challenges, and ecological risks, now exacerbated by climate change. We investigate the border-development-climate change nexus using research from Calakmul, Mexico and Petén, Guatemala, to detail the lived experiences and vulnerabilities of campesinos *in the Selva Maya cross-border region. Our mixed methods approach combines historical analysis and ethnographic interviews with 70 campesinos. We demonstrate how large scale development approaches result in local and specific policy interventions, but produce mixed outcomes for campesinos, neglecting the most marginalized. Despite the absence of any major border crossings, a porous border in this area allows flows of people, goods, and services to connect the region, but there are differential national outcomes. In Petén, many campesinos suffer from 'irregularity' (lacking rights to the lands where they live and cultivate), preventing access to state development benefits. In Calakmul greater climate change demands adaptations beyond the scope of recent policy interventions. We consider how the border region includes biophysical processes as well as socio-political and cultural ones, and we argue that policy interventions are required at global, national, and local scales to address structural inequalities and co-create local solutions to development, migration, and climate change challenges.*

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Introduction

Borderlands are often spaces of change, comparison, and possible tension. A border is both a territorial marker and a suite of processes in which daily practices reflect governance contexts (Paasi et al. 2022). It creates a zone across and a transition space between two territories. These territories may be pursuing different development trajectories, influenced by national socio-cultural and policy contexts far removed from the border itself. Less studied is the physical and biological context of borders; there is some dicussion on the *bordering of nature* and efficacy of transfrontier parks, but little on the *nature of bordering*. In this study we explore a borderland defined by a biologically and socially porous border that runs through tropical forests, inhabited by flora and fauna (including people). Are the people who follow forest paths and streams across the border invisible and unaffected by the material border? To what extent are such 'hidden' borders overtaken by physical global processes like climate change and to what extent do they still structure the lives of residents? In this paper, we unpack the lived experiences of a marginalised group, the campesinos,[1] who inhabit and traverse the Selva Maya. We explore the border-development-climate change nexus through this region of the Mexican–Guatemalan border which, unlike the busy border to its southwest, is little studied.

The Selva Maya is the largest tropical forest north of the Amazon, encompassing northern Guatemala, western Belize, and southeastern Mexico with over four million hectares of protected areas (GIZ n.d.). It is vital for biodiversity conservation and climate stabilization in Mesoamerica. Forests produce rainfall and atmospheric moisture, thereby helping to cool the climate and recharge groundwater (Ellison et al. 2017). Historically, these forests were home to the Maya civilisation and today the region is home to half a million people, including indigenous and mestizo campesino settlers and ranchers (Primack et al. 1999). The area is currently experiencing significant environmental and socio-economic change. Climate change is causing less predictable and more severe precipitation patterns, causing both droughts and flooding with already severe consequences for agriculture and ecosystems (Esperon-Rodriguez et al. 2019). Such impacts resonate with historical events, as erratic climate was involved in the demise of the Maya civilization in the region (Douglas et al. 2015; Evans et al. 2018; Turner & Sabloff 2012).

The Guatemala–Mexico border bisects the Selva Maya, as it runs for 871 kilometres between the Guatemalan departments of San Marcos, Huehuetenango, El Quiché, and Petén and the Mexican states of Chiapas, Tabasco, and Campeche. According to Fábregas Puig (2011), a southern border did not exist in the imagination of Mexicans until the 1980s,[2] when the civil war[3] in Guatemala poured thousands of refugees into the southern Mexican states (Chamarbagwala & Morán 2011; Manz 1988; Taylor et al. 2006). Northern Guatemala and southern Mexico more broadly can be considered a cross-border region, even beyond the Selva Maya, because of geographical, cultural, and social continuities (Villafuerte Solís 2017). At the macro scale, geopolitical interests converge, mostly with the United States government, for control and containment of irregular and illegal flows of drugs, weapons, migrants, while exploitation of natural resources has long been a central theme in the history of the region (Toussaint & Garzón 2020).

At the micro scale, the cross-border reality varies along the border. This paper focuses on the little studied border section in the Selva Maya between Mexico and Petén. Much of our recent knowledge of the Mexico–Guatemala cross-border region derives from research on the section between Chiapas, Mexico and San Marcos and Huehuetenango, Guatemala. There, the border constitutes a crucial territory connecting Central and South America with North America (Fernández-Casanueva 2020). This cross-border region is characterized by poverty, violence, and organizations demanding autonomy and resisting extractivist projects (Villafuerte Solís 2017), but also by strong social, commercial, and cultural ties that go beyond state boundaries (Fuentes Carrera 2020). In contrast, the forest of the Selva Maya presents a barrier to many cross-border activities in the north and northeastern section of the Guatemala-Mexico border region. We aim here to evidence the lived experiences and vulnerabilities of campesinos in this cross-border region, as they navigate the interlinked challenges and policies of neoliberal development and climate change. In so doing, our findings contribute to an understanding of the border-development-climate change nexus and inform practical future policy directions for the region.

Today, the campesino form of living is strongly shaped by changing conditions for cultivating land—particularly climatic, market, and regulatory conditions defined or mediated by states. The Guatemalan and Mexican governments aim to address current issues that campesinos are facing in different ways through recent developmental strategies and policy interventions. To address poverty and poor yields from a market-oriented standpoint, both governments devised increasingly neoliberal agricultural policies with the goal of improving food security for the poor and supporting the more industrialized agricultural sector (Carte et al. 2010; FAO et al. 2014). To date, these policies have failed to deliver on their promises for campesinos. Most campesinos in Petén and Calakmul remain largely subsistence producers, with some income diversification through additional activities such as beekeeping and remittances from family working elsewhere or national aid programs subsidizing household incomes (Taylor et al., 2006). Even though hunger has become rare in rural Mexico, it remains a concern in Guatemala, especially among families

with limited land access (Aguilar-Støen 2012; Carte et al. 2010, 2019). Agricultural policies largely have not reduced campesinos' poverty and, together with climate change, create a double exposure for rural communities and increasing the precariousness of their lives (O'Brien & Leichenko 2000). For example, campesinos are dependent on rainfall for farming therefore, the risks of drought or uncertainty at the onset of the rainy season exacerbate the challenges of agricultural production, especially on the drier Mexican side (Mardero et al. 2020a). Neoliberal policies have often exacerbated inequalities between large-scale farmers with capital and resources, and the more numerous campesinos (Carte et al. 2010). This article contributes to debates at the nexus of borders, development, and climate change through an examination of campesino precarity in this Selva Maya cross-border region. This cross-border case study enables analysis of development resulting from state and non-state factors (Novak 2016), including the effects of globally induced climate change in this local context.

The border-development-climate change nexus

There has been a shift in our understanding of borders as fixed, place-based entities to the idea that "borders are everywhere" (Balibar 1998), implying that multiple forms of limits are enacted throughout a territory via societal processes and discourses (Paasi 2009). Borders are seen primarily as socio-political constructs (for both 'dwelling' spaces and political responsibilities: Agnew 2008). Hence, both the different political contexts delineated by the border and the practices of bordering offer a rich ground in which to study development. The relationships between borders and development are contested and complex. Borders can trap us into territorial thinking and impede us from pursuits of development across state boundaries (Agnew 2008). Borders that are more open to the movement of people may facilitate development (through remittances and knowledge flows) and thus partially address deep structural inequalities, although they also potentially impede development within countries of origin (for example, through brain drain) (Tebble 2021).

Development has long been seen as both an "immanent and unintentional process" (such as the process of capitalism) and as "an intentional activity" (Cowen & Shenton 1998, 50), and it is generally accepted that political structural change and intentional specific interventions can co-exist and interact (Mitlin et al. 2007). Importantly, Novak (2016, 484) adds a third understanding, with development as "a set of social experiences and outcomes" for individuals and social groups. Understanding how the social experiences and lived outcomes for campesinos in this cross-border region reflect the intentional and unintentional development contexts for agricultural production, and therefore the actions of states, is thus critical to knowledge at the border-development-climate change nexus. Although this cross-border region shares the same forest, indigenous ancestry, and exposure to climate change, the fortunes of campesinos have diverged on either side of the border due to regional and national socio-political and historical contexts.

Climate change has already significantly impacted this region (Mardero et al. 2020b), exemplifying the influences of global capitalist practices on biophysical as well as social processes. While there has been limited theorisation of borders and climate change, it is understood that climate change will impact the mobility of human populations, including migration across borders (Cundill et al. 2021). The specific manifestations and reasons for this is context dependent and scaled. For example, climate change-induced reduction in crop yields in Mexico is significantly associated with migration to the United States of America and it is predicted that such emigration will continue as agricultural productivity declines (Feng et al. 2010). In addition, climate change will cause some species to move, which will have consequences for conservation and socio-ecological systems (Titley et al. 2021).

Since development and its wider policy consequences do not always reflect intention, we must explore the lived experience to understand them (Martin 2005; Novak 2016). Thus, we investigated local perspectives of campesinos through ethnographic fieldwork on both sides of the border. Specifically, we posed the following research questions: What "policy landscapes" (i.e. the imprint of policies on the landscape) have evolved around agricultural development and climate change on both sides of the border? How is climate change manifesting in this region and what are its consequences? What is the lived experiences of campesinos and what are their current vulnerabilities? What are the dynamics and fluidity of this borderland, and how are development interventions and climate change influencing these? By addressing these questions we seek to contribute to a wider understanding of the border and development nexus (Novak 2016) as it intersects specificly with climate change.

To answer these questions, we map the diverging trajectories of the region through a short historical analysis. We demonstrate evidence for, and effects of, climate change on agriculture and livelihoods. Finally, we explore the lived consequences of policy interventions for campesinos in Petén and Calakmul and investigate how they navigate the biophysical, social, and financial gradients across the border through an ethnographic approach. We aim to present a story sympathetic to the campesino that is cognisant of the complexities of context, with an emphasis on global imperatives. We conclude with recommendations for governance directions.

Methods

This research is grounded in the authors' experiences of working across multiple projects intensively for up

to 25 years in Calakmul, Mexico and more sporadically for up to 30 years in Petén, Guatemala (e.g. Schmook & Radel 2008; Schmook et al. 2013; Lecuyer et al. 2019; Mardero et al. 2020a). For this paper, we used an interdisciplinary and multi-method approach, drawing on results from multiple studies to interrogate the situation of campesinos in the Mexico–Guatemala cross-border region of the Selva Maya.

We conducted a brief analysis of the shared and divergent recent histories of Petén and Calakmul (since about 1950), with a particular focus on agricultural and climate policies implemented in both regions (Hanberger 2003). We then drew on ethnographic fieldwork with campesinos on both sides of the border. This fieldwork occurred in two villages and one hamlet in Petén and in 15 *ejidos*[4] in Calakmul.[5] We conducted 70 in-depth interviews within two research projects, in Petén and Calakmul in 2018 and again in Calakmul in 2019 and 2020. In Petén we used both snowball and opportunistic approaches to identify participants and in Calakmul we selected participants using systematised random selection. Interviews focused on (among other topics not explored here) campesinos' livelihoods, border dynamics, impacts of climate change on agricultural activities, adaptation to climate change, and experience with governmental programs. Most interviews were carried out in the respondent's home and lasted an hour on average. Informed consent was gained for recording, or, in some cases, before notes were written. Recorded interviews were transcribed and analysed in two ways. First, interview notes and transcriptions were analyzed using Dedoose (www.dedoose.com). Text was coded and classified into categories or thematic fields that emerged from an examination of the data (inductively). In this paper, we draw on themes in relation to the border, agriculture, and development. Second, we synthesised interview results into a narrative supported by selected indicative quotes to represent the lived experience of participants.

Study Regions: Background and Historical Analysis

Guatemala Study Region: Petén

Petén is the largest and most recently colonized of Guatemala's 18 departments, covering almost 36,000 square kilometres or about one-third of its territory (Zander & Dürr 2011). The current (2018) population of Petén is estimated at 545,600 (INE 2019), translating into a population density of approximately 15 inhabitants per square kilometre. According to the last census, 60% of the population was rural. Around 30% identify as indigenous (compared to 42% at the national level), belonging to Mayan groups Q'eqchi', Mopan, and Itzaj, while the remaining 70% identify as *ladino* (mixed European and indigenous descent) (INE 2019). Petén is by far the most forested department in Guatemala with 45.6% of its territory still covered by forest and the Maya Biosphere Reserve falls within its boundaries. Forest loss remains high at an annual 1.5% from 2010 to 2016, whilst the worldwide annual rate in 2015 was 0.13% (Ritchie & Roser 2021). Petén is known as Guatemala's "granary", because it accounts for 47.6% of the land used for maize (*Zea mays*) production in Guatemala (MAGA 2012). Here, Campesinos practice subsistence milpa,[6] planting maize and beans (*Phaseolus vulgaris*) as staple and commercial crops and other products for family consumption (tubers such as sweet potato *Ipomoea batatas*, fruits, etc.) and for sale (squash Cucurbita spp. and sesame *Sesamum indicum* seeds) (Zander & Dürr 2011). Much of the soils are shallow and unsuitable for intensive production. Low-lying areas are periodically flooded in the rainy season, often destroying harvests.

Mexico Study Region: Calakmul

Calakmul, a Mexican municipality of the state of Campeche, lies north of Petén across the border and covers approximately 14,000 square kilometres. Its current population of 31,714 inhabitants distributed over 158 localities results in a very low population density of 2.27 inhabitants per square kilometre (INEGI 2021), which is strikingly less than Petén. In Calakmul 85% of the population is rural (Sánchez Islas et al. 2019) and 44.1% were born in other Mexican states. Two thirds of the population consider themselves indigenous (68%) (Calakmul State Development Plan 2019-2021) with Chol, a Mayan people originally from Chiapas, being the largest group (74% of the indigenous population). Other groups represented in the population are Tzeltal, Peninsular Maya, Tzotzil, and Totonaca (INEGI 2015). Around 94% of Calakmul is covered by forests, partly because half of its extent corresponds to the Calakmul Biosphere Reserve (Metcalfe et al. 2020). Forest loss in Calakmul was estimated at 0.12% annually between 2001 and 2013 (Ellis et al. 2015); as in Petén, the rate of loss has been declining since the early 1990s (Ramírez-Delgado et al. 2014). Like in Petén, there is a pronounced precipitation gradient that constrains the type of tropical forests. To the north, where annual precipitation is around 900 mm, the seasonal tropical forest is drier and shorter, whereas precipitation to the south can reach 1400 mm, resulting in seasonal tropical forests where evergreen tree species dominate (Vester et al. 2007).

Despite similar soils, conditions for agriculture are not as favourable in Calakmul as they are in Petén because of differences in rainfall. In Calakmul, rainfall tends to be marginal for both crops and cattle. Individual households, using the milpa system, have cultivated smaller areas each year, while at the municipal level, total hectares under maize and chihua have augmented given an overall population increase (Schmook et al. 2013). Additionally, the importance of jalapeno chili (*Capsicum annuum*), once the most important

commercial crop, has decreased (Dobler-Morales et al. 2020). The most important commercial crop is currently chihua (*C. argyrosperma*), a squash variety cultivated for its seeds. Campesinos today may also engage in beekeeping, small-scale cattle ranching, labour migration (to the tourist corridor of the Caribbean and to the U.S.), or community-based forestry in the largest ejidos (Carte et al. 2010; Chowdhury 2010; Radel et al. 2010; Schmook & Radel 2008).

Colonization and Land Tenure in Petén and Calakmul

Most agricultural frontier colonization in Petén and Calakmul started around the 1960s, as roadbuilding in the 1950s better connected these locations to the rest of the country and encouraged settlement by landless families (Grandia 2009). Though both are considered agricultural frontier regions, and as such have only recently experienced agricultural expansion, their histories diverge in terms of how colonization has occurred, leading to distinct experiences of land tenure security.

In Petén, campesinos face land tenure insecurity because much of the land was settled "illegally" by internal migrants in search of land to pursue agricultural activities. Today, these campesinos are considered to have "irregular" status. Campesinos in Petén also face land scarcity due to natural population growth, in-migration, and the displacement of small-scale agriculture by cattle ranching and large-scale plantations such as oil palm (Zander & Dürr 2011). Most campesinos in Petén do not own land and must rent or borrow to cultivate (Grandia et al. 2013). According to a 2009 census conducted by the NGO Pastoral de la Tierra, 51% of the population had no land to cultivate. Furthermore, plots are becoming ever smaller as they are sub-divided for children, and soils are increasingly infertile which, together with either excess or lack of water, negatively affects production (Grünberg et al. 2012). This reduced or lack of access to lands has pushed some campesinos to settle in protected areas. In contrast, land rights in Calakmul were granted collectively through the institution of the ejido. Nevertheless, there are differences in land access and other resource-based assets between ejidatarios (who have access rights to land) and pobladores/avecindados (who do not have such rights) (Navarro-Olmedo et al. 2016). The size of the land holding also varies widely among ejidos, from 20 ha to 300 ha; yet campesinos in Calakmul cultivate only a small fraction of their land right, leading to an effective farm size ranging from 0.5 hectare to about 6 hectare (not counting, for some, area under pasture; see Dobler-Morales et al. 2020).

In short, Petén and Calakmul have similar recent settlement histories. National policies to encourage agricultural settlement and decrease political conflict

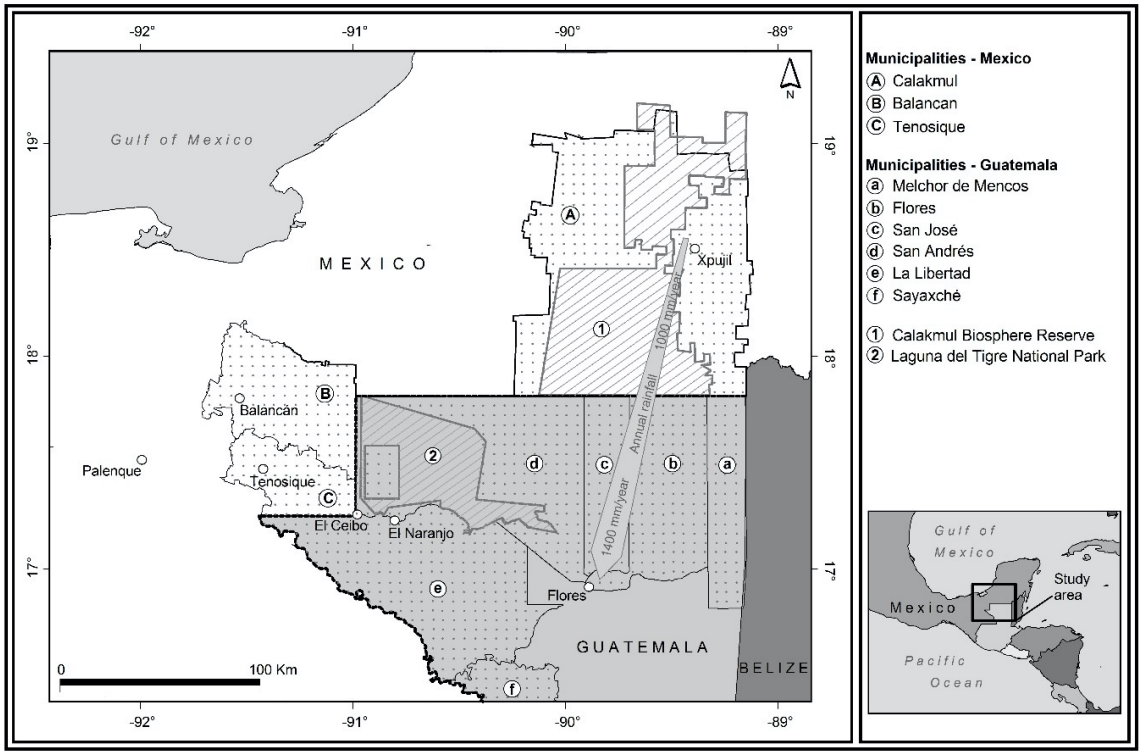

Figure 1. Study region, including municipalities (lowercase letters for Guatemala, capital letters for Mexico) and protected areas (numbers) on both sides of the border and the North-South precipitation gradient. Source: Map elaborated by H. Weissenberger, ECOSUR.

elsewhere, accompanied by road construction, led to similar patterns of re-settlement in the latter 20th century. In Petén, unlike in Calakmul, land access for poorer farming families was problematic from the start, leading to greater precarity for campesinos south of the border.

Agricultural Policies in Petén and Calakmul

Beginning in the early 1980s, many Latin American governments prioritized individual property regimes and reduced state support for campesinos, such as credit and extension services. With a renewed emphasis on large-scale agro-exports, rural areas experienced major transformations. There are areas where agribusinesses have not yet penetrated due to the impossibility of large-scale mechanization, a challenging climate, or difficult access - a situation experienced in Calakmul (Kay 2015). Nevertheless, campesino livelihoods in Calakumul and Petén have changed dramatically and income from farming is often less than 50% of total income. Today most campesinos here, as elsewhere in Latin America, can only subsist with off-farm income, remittances, state pensions, and antipoverty programmes (Kay 2015).

In Guatemala, after policies in the 1970s aimed at improving production for both national consumption and export, the 1990s saw the development of policies centered on the rural poor to improve nutrition and insert them in the market economy (FAPDA 2014). Today, agricultural policies and programmes continue to revolve around the same ideas. A flagship program of the Ministry of Agriculture ("Family Agriculture Program for the Strengthening of the Campesino") was implemented in 2012 and is central to the articulation of most national policies, including the national development plan K'atun Nuestra Guatemala 2032 (CIA 2015; CONADUR 2014; Gobierno de la Republica de Guatemala 2016). The Guatemalan government also continues to implement several other policy instruments to support the agricultural sector, based on the Gran Plan Nacional Agropecuario (GPNA) 2016-2020, with most supports focused on price protections. However, despite these policies being on paper and in the official discurse, many campesinos in Petén do not receive these benefits due to their irregular settlement status (see findings below).

Unlike Petén, rural Calakmul is characterized by a strong presence of government support. In the 1960s and 1970s, the Mexican state took up the challenge of improving small-scale ejido farming, through subsidies, providing low-interest loans to ejidatarios, and promoting agricultural extension to train and encourage farmers to use Green Revolution agricultural packages for crops (Vargas Hernández 2008). The system of guaranteed prices and the strong safety net of other supports came to an end in the 1990s after the North American Free Trade Agreement (NAFTA) took effect. As a result, the value of maize production per unit of cultivation declined (SIAP 2020), and poverty among rural households increased (Caceres & Richards 2002). In response to this, the Ministry of Agriculture, Livestock, Rural Development and Fisheries (SAGARPA) implemented its two flagship programs, PROCAMPO (1994) and Alianza para el Campo (1995) which aimed to support low-income agricultural producers during the transition period to an open economy (Yunez-Naude & Barceinas Paredes 2002). PROCAMPO (renamed ProAgro Productivo in 2014 and Produccion para el Bienestar in 2019) subsidised not only campesinos but also big landowners on a per hectare basis and has remained one of the most important agricultural programs in Mexico. The new agricultural and social welfare program, Sembrando Vida, inaugurated in 2019, generated high expectations among Calakmul communities, especially given its provision of a fixed monthly payment to campesinos for cultivating their lands.

Petén and Calakmul have both seen a litany of agricultural policies and programs for campesinos. Despite shared challenges with respect to trade liberalization and climate change, agricultural programs in Calakmul have brought significant benefits to campesinos, while programs in Petén have been unavailable to these poorer households due to their irregular settlement status.

Evidence of Climate Change

Climate change is already evident on both sides of the border. For Petén and the whole of Guatemala, there is an observed increase in temperature and precipitation variability (ECLAC et al. 2018; IPCC 2012). There is no area in Guatemala that has not suffered the effects of drought in the last thirty years. In the case of Calakmul, several authors report that precipitation and temperatures have also changed in recent decades, with more frequent and longer droughts, greater variability in precipitation, and higher temperatures reached more frequently and for longer periods (IPCC 2014; Mardero et al. 2012; Orellana et al. 2009).

Although both the Mexican and Guatemalan sides of the Maya Forest are affected by rising temperatures and precipitation variability, Calakmul lies in a drier zone (between isoyeths 900 to 1300 mm) of a precipitation gradient across the region and thus has suffered heavier impacts from droughts than Petén which is located in a wetter area (1400 to 2500 mm).

Results of the Ethnographic Interviews: Experienced Precarity

For the research results we focus separately on each country, with a narrative analysis of how associated national agricultural and linked climate change policy is

perceived through lived experience in the contemporary rural contexts of Petén and Calakmul. We supplement data from the interviews with additional data from our historical analysis. In the discussion that follows, we provide a comparative analysis for the cross-border region, including the movement of people, goods, and money across the border. This section is followed by an interrogation of the findings' implications for the notions and practices of borders.

Intimidation, Eviction, and Irregularity in Petén

Our interviews reveal that some of the Petén communities within Laguna del Tigre National Park, inside the Maya Biosphere Reserve, share a particular history of oppression and inequality related to land insecurity. Residents reported living with a constant threat of displacement, and thus loss of their agricultural livelihoods, by state and non-state actors. Since they moved to the area they have had to deal with the Franco-British oil company PERENCO paradoxically located within this protected area. Settled here to flee the armed conflict and associated resettlement policies, people in the area have never fully possessed land titles and have lived under the constant threat of eviction and intimidation. The oil company has not only caused extensive deforestation but has also displaced several communities and threatened local populations by militarizing the area.

In Guatemala, oil partly finances the army. In the framework of the extension agreement of the oil contract N°2-85 (the first concession contract), the "*Batallon de Infanteria de la Selva*", or "*Green Battalion*", was created. It is financed by PERENCO with $3 million (USD), plus a contribution of $0.30 (USD) per barrel produced (Collectif Guatemala 2011). The Battalion's official mission is to fight for conservation and combat drug trafficking but in practice (according to residents, NGOs such as *Salva la Selva*, and the *Collectif* Guatemala reports) the military intimidates locals who oppose projects for the exploitation of natural resources, violates the right to free movement of people and goods, and pressures communities against organising for the legitimate assertion of their rights. Soldiers occasionally burst into villages and threaten villagers with eviction. Incidents like these in the communities of El Progreso were a recurrent story shared by those interviewed. In these communities, leaders were promised support for village improvements if they signed a "voluntary eviction" agreement; sometimes they were bribed. After signing, they were told: "*Look gentlemen, your leaders already signed the voluntary eviction document, so we give you an eviction date*" (Resident from Rancho Nuevo, Petén 2018).

The National Council of Protected Areas in Guatemala (CONAP) has also tried to evict several communities from reserve lands on the basis of natural resource protection, even though they allow the presence of PERENCO. The communities filed a complaint with the Guatemalan government (backed up by the United Nations and international NGOs) to revoke the oil company's concession and gain land access, but more than two years later there was still no signed receipt by the government to acknowledge the complaint:

> *All the communities have appealed for land tenure, because, just as they need oil money, we need land and we want to have authorisation, even if it is just a piece, to live on something of our own, because if we are Guatemalans we have the right, but it has been two years since that document [the appeal] and President Jimmy Morales, the clown, does not want to sign it* (Resident from Santa Rosa, Petén 2018).

Informants explained the strong presence of drug-lords as another reason for the territorial dispute of the Maya Biosphere Reserve. According to one interviewee from Santa Rosa, Petén authorities (in collusion with drug-lords) exert pressure to evict campesinos who are deemed inconvenient:

> *Well, the truth is that in this area there has been a lot of drug trafficking, but those who have these organizations are the same people from the Government, they are people from the Government who work in this, and that's why it harms them that there are communities in the area* (Resident from Santa Rosa, Petén 2018).

Due to their irregular settlement status, the communities or *rancherios* (hamlets) located in the reserve receive no services or support from the Guatemalan government. There are no state educational services, therefore, in some communities residents have set up a small school with one teacher using their very limited personal resources. In a few cases they have a teacher paid by the neighboring Mexican (not Guatemalan) municipal government. There are no doctors or nurses, nor access to medical equipment or drugs in their communities; therefore, people cross the border to Balancan or Tenosique in Mexico when they require medical attention. According to a resident of Rancho Nuevo, it has been more than 10 years since the last visit from a representative of the Ministry of Health who, during his visit, only handed a first-aid kit to the community:

> *Here we do not have any government support. We knocked on the doors of the secretary of education in Petén and they told us, 'look, the truth is, we cannot give you a teacher because these are protected areas, and you cannot live there, you do not get any [state] benefits living there', and we came away empty-handed (...). In fact, we have support from Mexico for education and health (...) There is also the mobile health service; they vaccinate us and monitor the pregnant women and they don't charge you anything, only 20 pesos* (Alcalde auxiliar Rancho Nuevo, Petén, Guatemala, 2019).

Guatemalans frequently cross the border into neighboring Mexican communities to buy basic goods, mostly food, and to barter with local merchants often in exchange for agricultural products at lower than official market prices. The Guatemalan side of the border is also lacking services such as water and electricity. Some villagers and stores own a small solar panel or a generator. Water is extracted from wells.

Despite these adversities, many Guatemalans cannot relocate to other regions of the country. Some of them have thus decided to settle without authorization on the Mexican side instead. Border dynamics between Mexico and Guatemala have been challenging at times. One of the main problems has been, and remains, undocumented crossing of migrants, drugs, firearms, and other illegal goods. Currently, a major problem is the looting and cross-border trade of precious woods such as cedar (*Cedrela odorata*) and mahogany (*Swietenia macrophylla*) in Guatemala.

Conditions for Campesino Agriculture and Market Sale in Petén

Campesinos related that, as a result of living in 'illegal' communities on the Guatemalan side of the border, they never receive any kind of government agricultural extension or support. Campesinos in both Petén and Calakmul practice rainfed agriculture and grow mostly maize and beans for self-consumption and *chihua* for the market. Despite the lack of agricultural program support, productivity in Petén is superior given higher rainfall and better soils. Maize yields are typically 2 tons per hectare versus 0.5 tons per hectare in Calakmul. In Petén, however, many campesinos now cultivate less land and harvests are declining because of increased rainfall variability and weed invasion. Also, maize production has decreased because of its low profitability, and now campesinos prefer to produce *chihua*, which pays better and is easier to transport because it is lighter per volume.

Campesinos in Petén expressed that the climate has changed, although not as acutely as expressed by their counterparts in Calakmul. Some of the Guatemalan producers told us that about 15 years ago they began to perceive greater climatic variability and more drought years. As one resident explained,

> *It is no longer the same: now it has not rained well for several years, including this year. Last year the same thing happened to us. It has been now two years that I haven't been cultivating for this reason, the drought hit us hard* (Resident in a hamlet, Petén, 2018).

Despite the drought, campesinos from the Petén shared that they could potentially grow and harvest more, but difficult market access in Guatemala and the inconvenience of selling in Mexico keep them from doing so. Lack of roads and poor road conditions cause high transportation costs for agricultural products to move to the interior of the country, therefore, Guatemalan campesinos prefer to sell their crops in Mexico. Grain trade is very common between communities in Petén and communities in the Mexican border municipalities of Balancán and Tenosique (Tabasco), whereas between Petén and Calakmul there is no grain trade, as there are no nearby settlements on the Guatemalan side. In addition to the difficulties in transporting products, the Peteneros face discrimination and low prices from the Mexican middlemen. They receive three to four Mexican pesos per kilogram of maize (while Mexicans usually get five pesos), and for chihua seeds they often receive less than half the price paid to Mexicans. As one Mexican informant bluntly told us, the Guatemalan campesinos are "more screwed", and therefore it is easy to abuse them. That is why sometimes Guatemalans are blamed for low prices—they are more needy and therefore more willing to sell their products at a very low price. One Mexican buyer offered better prices than other buyers because he considered the prices paid to Guatemalans were generally unfair:

> *The problem is that they cannot store their harvests, they have to sell it because they are in need, they have to sell their harvests, even at low prices, or they have to give their harvest [to the buyer] and they pay them little by little* (Santo Tomas, Balancan 2018).

Increased rainfall variability has been accompanied by a trend of increased rainfall in Petén.[7] However, interviewed campesinos did not yet perceive climate change as negatively impacting agriculture (apart from those reporting the effects of drought in some years). In addition, the limited role of the state in Petén means that campesinos commented very little on national agricultural and climate policies. Interviewees did mention that they had heard that international NGOs sent funds and support to them in exchange for forest conservation, but they claimed that such funds rarely reached them and that reserve authorities keep this money. Interviewees also expressed discontent with the lack of incentives for their natural resource conservation efforts and were unaware of any government initiatives related to climate change mitigation or adaptation.

Changing Conditions for Campesino Agriculture in Calakmul

Campesinos in Calakmul related that they cultivate only small plots (less than two-to-three hectares on average), the vast majority without mechanization or irrigation. Traditionally, they sow maize in two cycles each year, with the spring/summer crop in May and harvested in September, and the autumn/winter crop, called tornamil, in October for harvest in February. Harvests can be up to one ton per hectare of maize during a 'good year', but yields usually oscillate around 500 to 800 kilograms per hectare. During 'bad years', caused by severe drought or pests, harvests can even be less than 100 kilograms per hectare or nonexistent:

> *Now it rains less. When I arrived, there was more humidity, it rained a lot, but now it is almost pure drought. Before, the sun came out, but quite normal, now the plant is burned: in the morning it is still fine, at 10 or 11 o'clock, it is already too hot (...) it (the plant) is already in a poor condition, the leaves wither* (Resident from La Paz, Calakmul, 2018).

Many campesinos reported decreasing yields because of the increase in the number of severe droughts and pests (wildlife and diseases), more irregular and declining rainfall, and extreme heat. In addition, crop cycles and the agricultural calendar have also changed due to rainfall variability, especially since the mid-1990s. According to interviewed campesinos, traditional sowing dates are increasingly delayed due to the late onset of the rainy season. Some informants reported that when the rainy season starts too late, they do not cultivate their plots and rather wait for the *tornamil* (autumn-winter cycle). This has severe consequences, as one maize harvest is not enough to feed a family for a year, making it necessary to purchase it. Other campesinos continue to cultivate during the spring-summer cycle, but crop losses, such as those due to unpredictable weather conditions, are a constant threat. As stated by a resident of Villa de Allende, in Calakmul (2018), "*here the time for sowing has changed a lot, because of the rain*".

In addition to new climatic conditions, campesinos also linked the decline in production to soil degradation caused partly by fallow shortening. According to a few respondents, until the 1990s one could choose where to cultivate and move freely from one part of the *ejido* to another and practice fallow cycles of up to 10 or 15 years. However, shifting cultivation has changed because of the combination of: 1) the implementation of the Program for the Certification of Ejido Rights and Land Titling (PROCEDE), which allowed for the transfer from collective to individual land tenure in *ejidos*; 2) the need to provide land to new people arriving in the *ejidos* and to the children of the original settlers; 3) conservation measures (prohibition of clearing and burning old-growth vegetation and forest for new plots); and 4) agricultural policies that limit areas for crop cultivation or promote the conversion of milpa to pasture. All this has resulted in a significant fallow reduction (from 10-15 years to less than 5 years), with negative impacts on soil fertility and an accompanying increase in agrochemical inputs. As one campesino from an *ejido* in the southern part of Calakmul explains:

> *Before there were more possibilities of rotating plots because land was not limited. One could work whenever wanted: one hectare here, two hectares there. The land was beautiful. Nobody prohibited it, because everything was free. Now, because everyone has their [own] plot, you'll have to work in it and the next year the same. I haven't been moving to another plot for four years or more* (Resident of La Paz, Calakmul 2019).

Agricultural and Climate Change Policies and Initiatives in Calakmul

In contrast to Petén, rural Calakmul (and the Mexican countryside in general) is characterized by state omnipresence and a wealth of support programs: subsidized agrochemicals, monetary support after climatic disasters, monthly money transfers to producers, payments for environmental services, and social assistance programs, among others. Campesinos mostly referred to two agricultural programs: the well-known and long-standing PROCAMPO (aka *ProAgro Productivo and Produccion para el Bienestar*) and the new agricultural and social welfare program *Sembrando Vida*. Campesinos' decisions are driven by opportunistic responses to agricultural policies and programs. This is especially true with the new *Sembrando Vida* program.

From the outset, *Sembrando Vida* generated great hope and high expectations among farming communities. The program has been especially attractive to *pobladores* (rural villagers without formal rights to land) since, unlike other agricultural programs, it is not necessary to present a land title. Many perceived it as an opportunity to return to work their own land, to be campesinos again, and no longer to be employed by others or leave the community in search of work:

> *Before, we campesinos worked 'for free' because we worked our own plots and lost the harvests, we made no profit, and we had to work [as farm hands] for a day wage [and we had] to work other people's land to have a little money. Sembrando Vida now means working for oneself, for one's own benefit and on one's own land, and thanks to that, the campesino who was away returned to his land* (Resident from La Paz, Calakmul 2018).

Campesinos expressed greater satisfaction with current federal support programs compared to those in previous years. However, program policies appear to undermine campesinos' autonomy and local knowledge by dictating how they must manage their sponsored plots, sometimes changing the way they previously managed them. For example, every year land preparation for the milpa was undertaken using traditional slash and burn techniques, and more recently the use of herbicides to combat the increased weed pressure, but now both are prohibited. Additionally, some campesinos commented that *Sembrando Vida* imposes agricultural techniques that in their experience do not succeed.

Mexico has policies to promote climate change adaptation and mitigation in the agricultural and rural sectors, but their implementation is not always clear. The campesinos interviewed were not aware of any action plan on climate change and reported that they have not received any training from the government on how to adapt and deal with this issue in their agricultural activities. The only actions identified by

some of the respondents were related to conservation and reforestation measures, through the increasingly popular National Forestry Commission's (CONAFOR's) Payments for Environmental Services (PES).

Discussion: Development Within or Across Borders in a Context of Climate Change?

The above campesino narratives of development, policy intervention, and climate change have consequences for the border in theory and in practice. As we already know, the border is not defined merely by territory and global forces such as neoliberalism affect both sides of the border in our study region (Agnew 1994; Paasi et al. 2022). Campesino experiences evidence that climate change, another global issue, also influences development as immanent and unintentional *across* the border (Cowen & Shenton 1998). However, such global influences also affect these development processes differently *within* borders because of the diverse cultural-historical contexts and policy landscapes (i.e., development as intentional practice).

In both Petén and Calakmul, on either side of the border in the Selva Maya, clear historical phases can be identified. The rise and collapse of the Mayan civilisation occurred due to combined climatic and political changes (Turner & Sabloff 2012). Subsequently, colonisation abused natural resources and created deep social inequalities. Continued unrest and population pressures (particularly on Petén from further south in Guatemala) and government incentives (especially for Calakmul) led to (re)colonization by settlers and indigenous people from other locations. Current settlement resulted from campesinos fleeing war and poverty or seeking agricultural land. High rates of deforestation by new settlers pushed back the forest frontier with agricultural activities. However, this has not led to prosperity for most settlers, with wealthy ranchers owning extensive tracts of land and many campesinos eking out an existence, sometimes in high population densities (in Petén especially) and without land tenure (*pobladores* in Calakmul and the majority of campesinos in Petén). As a result, this cross-border region now hosts a heterogeneous matrix of people from different ethnicities, with diverse rights to land, and different levels of power and autonomy. The inequalities deriving from these national histories have increased vulnerabilities for the poorest and most precarious of campesinos in this border region. This situation is particularly exacerbated in Guatemala where campesinos have been forcibly intimidated or removed, not only by the state but also by large private companies and organized crime.

Different state approaches and regulatory frameworks have led to a range of interventions to support development on either side of the border, creating contrasting landscapes of policies. The contemporary policy landscape for agriculture on both sides of the border is still strongly influenced by neoliberal approaches, trying to engage campesinos in markets and rewarding larger commercial enterprises. However, in Petén, the few programs and policies that support campesino production have had little effect because of the violence, intimidation, and the "irregularity" as described above that prevent campesinos from accessing associated program benefits. In Mexico, the most recent policy, *Sembrando Vida*, aspires to restore dignity to the work of campesinos and therefore should incorporate recognition of the importance of their agricultural production. Campesinos receive program benefits if they comply with the rules and attend compulsory meetings, regardless of how much they harvest. This research uncovers how campesinos experience these policy landscapes in this borderland, in line with other border scholarship that explores daily practices in border regions (see: Paasi et al. 2022). In Petén, for example, campesinos considered the global discourse of combating climate change to reinforce national policies to destroy "irregular" communities discursively labelled as forest destroyers, while ignoring, as a cause of forest destruction, oil extraction, the activities of organized crime, and the expansion of agribusinesses potentially linked to them.

The consideration of climate change within the border-development nexus is an important addition to understandings on borders and development. Precipitation increases along a gradient from north to south across this border and therefore creates differing opportunities for agriculture as well as different forest characteristics. Biophysical parameters relating to climate and climate change thus occur not as binary manifestations between two territories separated by a border, but rather as a gradient traversed by the political border. The gradient is dynamic and exhibits trends for temperature increase and precipitation change. In Calakmul, the longer-term, severe effects of climate change have forced campesinos to adapt by themselves while simultaneously developing increasing dependence on government support. As climate change worsens globally, campesinos in Petén, further south along this gradient, will also experience greater effects of climate change. This gradient thus offers the opportunity to develop and implement policy for climate change adaptation in the north and share lessons to the south. We propose that future research investigate and monitor this gradient and support learning and practices at individual, farm, and regional scales to mitigate and adapt to climate change. As we have demonstrated, the border serves as a political marker and enables us to explore the efficacy and consequences of different policy and regulatory instruments.

Climate-change-induced crop failures and lack of access to markets limits agricultural development across the region. Existing precarity means that people cannot respond effectively to changing conditions. Hence, the immanent process of development and intentional development interventions interact as neoliberal, capitalist approaches

to development in Latin America (Cowen & Shenton 1998; Mitlin et al. 2007). Planned interventions together support the established elite, further marginalize those without formal land rights, and risk exacerbating inequalities. Against this background, some Calakmul campesinos diversify or even leave farming to engage in alternatives where possible and Petén campesinos experience even fewer options (Carte et al. 2010). Our results demonstrate the complexity of power and social relations in relation to interactions of climate change and development in this cross-border region.

Campesinos in this study expressed despair and resignation in the face of their perceived lack of agency to address local practical challenges (e.g. lack of market access) combined with external challenges (e.g. militarised intimidation) and non-human challenges (e.g. lack of rainfall, higher temperatures). In Petén, there was a lack of faith in national intervention (with the experienced absence of the state); whereas in Calakmul there was hope and then some disillusionment over the latest interventions (with an experienced omnipresence of the state). Exploring the "lived experience" of these actors situated within policy landscapes reveals how marginalised campesinos feel powerless in the face of development and climate change (Carte et al. 2010; Green et al. 2020; Martin 2005). "Irregularity", or lack of formal land rights, especially in Petén, means that many campesinos cannot benefit effectively now from agricultural or climate change policies. In the absence of fundamental changes, attempts at financial support for the region could further embed the elite and further marginalise the poor.

As climate change is the result of industrialisation and 'progress' mainly in the global North, but with dire impact in the global South including for campesions, there is a moral imperative for global action. The question is how we navigate a role for international actors, especially in cross-border regions, to contribute to an alternative development future, without negating national interventions (see Mitlin et al. 2007). Currently, international climate change programs such as REDD+ focus on climate change mitigation and do not always deliver for the most marginalised groups (McGregor et al. 2014). While these programs may offer some support for campesinos and create positive ecological and carbon outcomes, they rarely tackle adaptation or address the underlying issues of inequality, land rights, and non-sanctioned intimidation by criminals or private companies. The dual global climate change challenges of mitigation and adaptation will have to be tackled with international and cross-border agreements as well as local contributions. Whilst mitigation was initially at the forefront of global climate change discourse, as the impacts become more visible and viscerally felt, adaptation has become more prominent and '*mitadaptation*' (actions for both mitigation and adaptation) is being urged. Borders can "limit the exercise of intellect, imagination, and political will" (Agnew 2008) by creating structural barriers within a region such as the Selva Maya. However, it is critical that climate change adaptation learning developed in Calakmul is shared with campesinos in Petén, and that relevant new livelihood practices can be co-created across the border region.

The geography of the biophysical context of this cross-border forest region, the Selva Maya, offers additional complexities. The forests in Calakmul and Petén create a continuous habitat for rich biodiversity, while the absence of roads, on the Guatemalean side and traversing the border, creates a barrier for humans. Yet this is not a hard barrier. Our research reveals that many human crossings and exchanges do occur to the west of Calakmul, due to closer settlement proximities. Any consequences of a clear binary of national policies in the cross-border region is thus eroded through the movement of people, goods, and finance. For example, many Petén residents seek healthcare, education, or access to markets in Mexico.

What does this mean for our understanding of the dynamics and fluidity of borders, particularly on the border and development nexus (Novak 2016), together with climate change? Borders are now conceived less as concrete boundaries between states and more as contextualised social and cultural processes (Paasi 2005). In this paper, we argued that different bio-physical processes on each side of the border shape differential social responses. Borders produce both institutionalised practices of governance and emotional responses to historical memory and future expectations (Paasi 2005). Being situated mainly within the forest, without built infrastructure, the Selva Maya border between Guatemala and Mexico has little public performance of border-ness. Nevertheless, the border reveals different governance approaches and their impacts on either side of the border, at the same time that the border remains porous to resultant flows.

Conclusions

This study is innovative in its analysis of the Mexico–Guatemala cross-border region in the Selva Maya and its interdisciplinary and mixed methods approach combines historical socio-political analysis and ethnographic results to explore the border-development-climate change nexus. In line with Novak (2016), we conclude that exploring borders and development together can strengthen our understanding of both, but that climate change now must be central to that exploration. We have shown that analysis in a cross-border region can inform policy interventions for climate change and agriculture. We found that the wider processes and approaches to development at national levels interact to create local experiences of specific policy interventions, unfortunately neglecting some of the most marginalised campesinos. Exploring the lived experience of policy enabled us to examine efficacy of interventions from the perspectives of the

interviewed campesinos (Martin 2005; Mitlin et al. 2007; Novak 2016). This study revealed how current inequalities are the result of long term and complex historical and socio-political events and processes, and that these limit future transformative modes of development. The Selva Maya border is porous and even superceded by social ties, with the transfer of some people, goods, services, and illegal activities even in this isolated and forested region. The political border traverses an important biophysical gradient of climatic parameters. Overall, this cross-border region offers a unique opportunity to explore how socio-political histories, policy landscapes, and climate change are creating mixed outcomes for campesinos in the region. Campesinos on both sides of the border in the Selva Maya require support to strengthen resilience against the interacting issues of climate change and agricultural development challenges. New development approaches should address structural inequalities and global change mitigation and specific local adaptation interventions, whilst also recognizing the unique trans-border cultural and ecological richness. Borders can be seen as both "discursive landscapes of social power/control" and "technical landscapes of control" (Paasi 2009). We suggest that borders also create different policy landscapes that represent and influence the experienced development journeys in adjacent territories. The connectivities of borderlands can soften the hard lines of development policy between such territories by enabling some flow of people, goods, and services across the border, as we have shown here (see also: Paasi et al. 2022). We also need to appreciate the ecological landscapes of borders; the present characterization of a border is a product of not only past socio-political and cultural processes but also trends in biophysical processes. Hence, the effects of climate change will increasingly interact with development approaches within and across borders, demanding serious consideration to address the precarity of marginalized groups in borderlands.

Acknowledgements

RMW, SC and BS were recipient of funding from Scottish Funding Council through the Global Challenges Research Fund (2017-18 and 2018-19). SM received a Postdoctoral Research Grant, CVU 292956, from CONACYT, BS participated and received funding from a CONACYT-FORDECYT project with grant number 281987 (Mexico).

Notes

1 We use the term *campesino* in the absence of an English equivalent; neither smallholder farmer nor peasant capture the identity, relationship to land, and often precarity of the campesino (Boyer 2003; Wolf 1955). Eric Wolf (1955, 453–54) established three basic criteria for defining the peasant: (1) agricultural production as the main occupation, (2) effective control of the land and autonomous decision-making over crops, (3) a subsistence rather than reinvestment orientation. These three criteria also form the core of the term campesino. However, campesino does not have the negative connotation of the term peasant, or the entrepreneurial, profitmaking, spirit of the term farmer.

2 It was the 1982 incursion of the Guatemalan military in Mexico to kill refugees in a camp in Márquez de Comillas that made the Mexicans suddenly perceive their southern border. This incursion horrified Mexico because it gave sudden concrete form to the civil war in Guatemala and violated Mexican territory by a foreign force.

3 The civil war in Guatemala (1960-1996) is arguably the most turbulent and bloody conflict in recent Latin American history. Approximately 200,000 people lost their lives or disappeared, more than 500,000 were displaced, and many Mayan villages were destroyed (Chamarbagwala & Morán 2011; Taylor, Moran-Taylor, and Rodman Ruiz 2006). Petén was among the six departments with the highest number of casualties per 1000 inhabitants (Chamarbagwala & Morán 2011). During the years of violence, many Guatemalans fled to refugee camps across the border in Mexico (Manz 1988). Campesinos in Petén, many of whom had moved to Petén to find better living conditions by gaining access to land and to escape the massacres that resulted from the intensification of the civil war in the highlands, suffered in many ways from the civil war. Not only did they suffer atrocities at the hands of the military, especially during the worst period of 1979-1984 (Chamarbagwala & Morán 2011), but many also lost their land as more and more title deeds were distributed to people closer to power (military, large landowners, etc.). These land grabs were triggered, at least in part, by a World Bank project aimed at regulating land rights in Petén.

4 *Ejidos* are communities defined by common property practices instituted through agrarian reform after the 1910 Mexican Revolution (Perramond 2008).

5 Names of all communities have been changed.

6 Milpa is derived from Nahuatl and means "cultivated field". Using shifting cultivation techniques, a small field is cleared and burned, from mature or younger forest, cropped for a few seasons with maize and companion crops and left in fallow to restore soil fertility and eliminate weeds.

7 We performed analysis of rainfall historical tendencies for both sides of the border, which revealed rainfall variablilty and rainfall increase in Petén.

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