
Ruling Frameworks and Fire Use-Conflicts in Tropical Forests of Chiapas, Mexico: A Discourse Analysis

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Additional information is available at the end of the chapter

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Abstract

The use of fire within tropical forests to settle agriculture and livestock systems has long been causing a bottle-neck for governmental and environmental development agencies, especially in natural forested areas with local population. An international strategy followed since many years ago is the decree of special territories with vast forests as natural protected areas (NPA). In Mexico, environmental laws can run contrary to customs and practices of natural resource-dependent communities which still use fire to farm their lands as unique livelihood activity. The chapter examines two conflicting frameworks of resource management (forest and soil) and governance in a forest village's efforts to comply with federal policies against fires in a NPA of Chiapas, Mexico. Forest and soil management is a key *locus* in California village, where governance structures come into conflict with hierarchical State power. Participatory workshops and semi-structured interviews were primary research instruments for data collection and discovery of community front and backstage. Ethnography and discourse

analysis were used as main tools for the analysis of information. While the State leads the conservation efforts and limits cultural activities and local actions through coercive laws, the land use and resource-dependent communities defend their access rights, and they also determine how to individual or collectively manage fires in daily activities. Finding collective solutions with horizontal-dialogue strategies represent an important issue and a pending task for the development and preservation agencies focused on forested areas. Backstage dialogue is a tool for village self-preservation when livelihood strategies are at odds with protectionist conservation efforts.

Keywords: conflict management, biodiversity, governance, customary laws, farming styles

1. Introduction

Mexico is considered to be one of the most biologically diverse countries in the world, with 10–12% of the world’s known species [1]. Since the 1970s, creation of natural protected areas (NPAs) has increased as a conservation strategy, and these biodiversity “reserves” now cover nearly 13% of the country’s land surface [2]. NPAs are designed to implicate the participation of several actors from the public and private spheres, including federal agencies, government-contracted biologists, nongovernmental organizations involved in agricultural extension services, and local communities. By means of the participation of each, the actors are expected to foment conservation and alternative use of natural resources [3, 4]. Nearly, 60% of Mexico’s NPA surface is within the United Nations’ “Man and the Biosphere Program¹” reserve category, making these federal reserves the country’s most important NPA category [2]. Governance of biosphere reserves has been a challenge, due to the immense diversity of agroecological conditions, evolving cultural practices, and agrarian pressures that are found in such places, as well as the multijurisdictional, complex nature of conservation planning and implementation in Mexico.

Like all of Mesoamerica, southern Mexico has millennial traditions of agriculture, often based on shifting fields and the periodic use of fire. Tropical ecosystems store most of their nutrients in plant matter, rather than the soil, so for centuries indigenous farmers used to burn areas of forest in order to create fertile beds of ash. On these fertile beds, new crops and native grasses can be grown for a few years, while adjacent fields are left to regenerate. Known as *slash-and-burn* or *swidden agriculture*, these indigenous systems are still being practiced today.

The use of fire within agriculture systems has long provoked the ire of governmental development agencies in many countries, which seek to replace them with permanent field agriculture [5]. Swidden agriculture was opposed during the Green Revolution years in Mexico for its purported

¹The Man and the Biosphere (MAB) Program is an intergovernmental scientific program aiming to set a scientific basis for the improvement of the relationships between people and their environment globally [8].

low productivity, while more recently it has been called environmentally destructive, often without consideration of its complex ecological bases [6, 7]. In addition, the growing evidence of climate change, such as recent severe droughts, is another important element feeding the external as well as internal discussions on traditional fire practices. The argument about climate change, in combination with major forest fires in the 1990s, as well as increasing population pressure on land resources, made peasant fire use a target for environmental regulation in Mexico. Mexican federal regulation generally seeks to prevent the practice, without offering a clear alternative for agrarian communities.

In Mexico's southernmost state of Chiapas, many rural communities rely on *usos y costumbres* (customary laws)—rules based on unwritten tradition and typically used only in much older communities—to provide the legal and political framework for governing daily life and managing conflicts. These diverse and often unwritten codes also guide community processes of adaptation to change, such as the kinds of restrictions put in place by nature reserves [9]. In the case of fire use by communities, federal environmental law and NPA rules generally seek to prevent the practice, without offering a clear alternative for agrarian communities. Official governmental regulation therefore sometimes comes into conflict with *usos y costumbres*, leading to tension between local communities and government officials.

In order to better understand the internal processes that guide communities' use of fire, as well as the tensions between federal rules and local *usos y costumbres*, a long-term research was carried out on the political and social dynamics of the peasant village of California in the Sepultura² Biosphere Reserve of southwestern Chiapas, where the local community is at odds with federal environmental management agencies.

2. Methodology

2.1. Regional and social context

California is located in the Frailesca region of Chiapas. The region is made up of valleys and plains dominated by monoculture maize fields with Green Revolution technologies, surrounded by mountainous zones where traditional farming methods are practiced by small communities. Near the region's major city, Villaflores, the School of Agronomic Sciences from the Autonomous University of Chiapas (UNACH) sits up against the foothills of the imposing Sepultura range. As part of the research and extension services offered by the university, a research team³ was formed in 2003 and later on in 2014 to conduct fieldwork in small settlements of the Sepultura Biosphere Reserve. It was planned to examine among other things, why (a) the use of fire is a sensitive social issue in the villages; (b) basic grain production was losing importance in the region, and (c) to promote farmer innovation toward more sustainable

²*Sepultura* means "tomb" in Spanish.

³The research team consisted of four professors and six to ten BSc and MSc degree students from the universities of Chapingo, Chiapas, and Wageningen.

technologies. For a period of 6 years, the researchers visited the village on a regularly basis, gathering data and providing extension services. This chapter focuses only on the research aspects of the process carried out.

A major challenge for agronomy and agricultural sciences is to break out of top-down, traditional extension model and to embrace more horizontal, participatory research models. A necessary part of this transition is to make researchers and students sensible to the cultural diversity in rural communities, recognize local knowledge, and promote a “dialog between differing knowledge systems.” Rural researchers in Latin America who embrace these needed changes often follow the tradition of participatory action research as suggested by the Mexican agronomist Efraim Hernández-Xolocotzi [10] and Colombian sociologist Orlando Fals-Borda [11], as well as the educational work of Brazilian pedagogue Paulo Freire [12, 13]. Participatory action research, also built on the thinking of these authors, with its emphasis on the creation of spaces for reflection and dialog in the village, guided this research in California.

The methodology used in this research was developed as an innovative mix of two approaches: action-oriented and ethnographic (socio-anthropological) research methods as suggested by [9]. An action-oriented approach was assumed looking for the village’s inclusion as part of the research process, particularly for the discovery and reconstruction of historical moments and the sharing, reflection, and negotiation of factual information. Villagers were seen as more than passive participants and took an active role in all the field work undertaken. Thus, the action-oriented methodology relied on a participatory action research (PAR) perspective. Then, at least a learning cycle through action was run, while the stimulation of collective reflections during the workshop implementation was encouraged. According to [9, 14, 15] by using a PAR perspective, at least six important contributions are done: (1) the stimulation of a collective learning process while acting on investigated topics, (2) the achievement of worthwhile outputs beyond the specific research interest, (3) engagement of participants in a collective learning reflection process, (4) bringing out local inertias as topics to think about, (5) bridging the gap between researchers and the researched, and (6) challenging current research paradigms. In this sense, the research team came in and out of the village during two periods, in 2003–2007 and 2014–2016 (**Figure 1**).

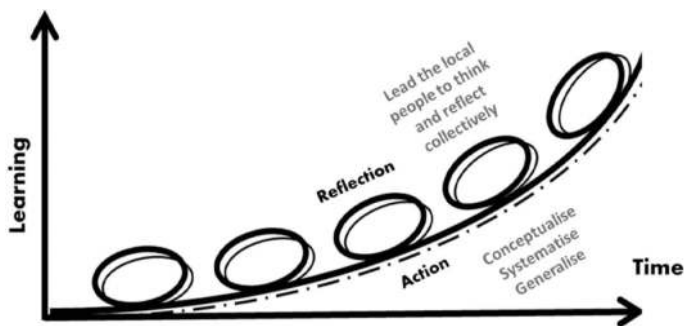


Figure 1. Action and research cycles in participatory action research. (Source: Modified from [14]).

From the outset, relationships between the inhabitants and outsiders were clearly conditioned by the history of the village's complex interactions with municipal and federal authorities as it fought for recognition as an *ejido*.⁴ As it became clear in the beginning of the research that certain frustrations and doubts deeply held by the village were not explicit in public settings, researchers felt the necessity to start using ethnographic methods during the first months of fieldwork [16]. In addition to participatory research, ethnographic methods have become a respected element of community-oriented research, due to their capacity for bringing together many accounts of daily life "as seen from below" into coherent narratives to reveal a sociocultural reality often overlooked by conventional expert-based research methods [17, 18].

During 2003–2007 and later on from 2014 to 2016, six participatory workshops of 3 days each for every research period were conducted. During the workshops, a collective timeline was built, and topics such as the economy, production, the village's relationship with the Sepultura Biosphere Reserve, and other local issues were discussed. In addition to the workshops, researchers conducted a total of 240 interviews over the course of the fieldwork, including women and men, elders, and youth. The semi-structured interview was employed, allowing interviewees to speak about the issues they pleased, although researchers returned to certain specific questions in order to guide the conversation [19]. Questions are related to a wide array of California, agricultural, and environmental issues, including the history and conflicts concerning fire use by residents.

In the coming sections, a reflection on a series of action research and ethnographic findings in both research periods in relation to a long-term confrontation California had with federal government agencies' rules with regard to traditional fire use in the forested area to settle traditional farming systems is drawn. Narratives and discourse analysis as main tools for the analysis of information are used to describe the context and village discourses on fire use, confrontations, and negotiations on the use of local natural resources in California. Peoples' names have been changed in order to protect their privacy.

3. Results

3.1. Updating on current conditions of California village

The Pacific coast of Chiapas practically runs east-west, bordering Oaxaca on the west and Guatemala on the east side. The *ejido* or village called California is the second highest in elevation of a string of communities along a fast-moving river that flows from the heights of the western Sierra Madre mountain range into the coastal plains to the south. The highest location, Tres Picos, is named after the mountain it sits under. California and its downstream neighbor, Los Angeles, were so baptized as humorous tributes by migrants returning from the United States.

California is built on a flat area of a high-altitude tropical forest with about 2550 mm annual rainfall and an elevation of 1500 m a.s.l. Rainfall generally occurs in the period of May until

⁴*Ejido* is Spanish for "a sort of collective lands or communal fields" but here also refers to California.

September, often coinciding with the presence of cyclones and tropical storms. The village has in 2017 about 900 residents and is one of several small rural communities in its municipality (**Figure 2**). Most habitants are *mestizos* with substantial Maya ancestry; they have settled from several different regions of Chiapas, making California a culturally diverse settlement.

The 1222 ha of land held by the *ejido* are managed under two systems: individual plots for farming and common property forestlands used for firewood and construction material. Villagers traditionally cultivate maize, as a maize commodity boom in the 1960s led to the creation of an agricultural frontier in the mountains of the Frailesca region, and landless farm workers foresaw the opportunity to farm maize profitably in the highlands [20]. Most residents live primarily as small-scale agriculturists, with maize-bean-squash *milpa*⁵ systems covering



Figure 2. Location of California in the municipality of Villaflores, Chiapas (Mexico).

the surrounding hills during much of the year. A small amount of cash crop sorghum and chili pepper is also grown in fields, as well as diverse assortments of fruits, vegetables, and herbs in home gardens. Production is generally for domestic consumption or used to grow livestock, which in turn is the major cash income source to California. The traditional *milpa* production system is increasingly being converted into cattle pasture. Cattle possession is a function of family wealth and a solvent reserve capital for peasant families. Most families have no cattle, but those who do have cattle have between eight and ten cows in nearby fields.

3.2. Recalling the history of California

A social reconstruction of California history took place during the workshops in the first period of the research, in which all sectors of the village were represented, in an assembly room with nearly as many women as men. In total, there were about 30–50 participants in each workshop. Elders had a lead role in the workshops; their explanations of past events were often confirmed by nods and reminders from the rest of the group. During these sessions, the frontstage aspects of California life were apparent: a unifying narrative, the collaboration of all residents present, and the obvious affection between young and old.

California was settled in 1975 as a land occupation by settlers from different parts of Chiapas. Many came from regions of social unrest or zones affected by Chiapas' massive hydroelectric projects. Most of the future residents of California met in the earlier and larger downstream settlement of Los Angeles while working as farm laborers. They learned of a wealthy landowner who had abandoned part of his property in an area nearby. About 20 people met secretly for some months and planned an invasion of the abandoned ranch and forested areas. Following a strategy that was commonly used to access land in southern Mexico during the 1970s and 1980s, they occupied the ranch without warning in spring (1975) and set up plastic shelters under the trees to serve as houses. Between 1975 and 1980, scores of other families joined them, but it was not until 1981 that California began to take on the appearance of a permanent settlement, with the construction of the first wooden houses. In the meantime, settlers planted small areas with crops such as maize, beans, chili peppers, and squash, using machetes, axes, and fires to clear the densely forested land. At the first meeting to create a local assembly in 1980, the settlers collectively claimed 1222 ha of forest for future agricultural and firewood needs. A committee composed of seven elected representatives began regular visits to the Villaflores municipal offices and the local branch of the Ministry of Agrarian Reform (now Ministry of Agrarian, Territory and Urban Development: SEDATU), to negotiate for land use rights and title as a communal settlement or *ejido*. At the meantime, the owner of the former ranch took steps to legally defend his land from the settlers.

3.3. The conflict emerges

After nearly 15 years of negotiations, California was finally recognized as an *ejido* or village and the former owner indemnified by the Mexican government. The official decree and federal

⁵ *Milpa* is Spanish for "maize field," but in the past, it was a generalized multi-cropping system of maize, beans, squashes, and chili peppers.

certificate of right holders were personally handed to the *ejido* commissioner by President Ernesto Zedillo (1994–2000) in August 1995. The president made a public act of giving land rights to the residents, and at the same time, he promised federal resources (budgets) for the region, which had been declared a national disaster area after being badly affected by Hurricane Herminia.

President Zedillo's visit in 1995 left California residents with several impressions. The first was that he would support local communities damaged by the hurricane (during his visit, he provided some construction materials to residents to construct new homes). Second, he gave an official blessing to local practices and rights of residents, through the certificates of occupancy he awarded. This gave the settlers the assurance that they held rights to the land they had occupied and settled. However, villagers were unaware that 1 month earlier, Zedillo had decreed the Sepultura Biosphere Reserve, a vast protected area in high forests, which included the territory of some hundreds of small communities, including California [21]. When the reserve was created, official federal rules for resource use in the Sepultura Biosphere Reserve were put into place that were in sharp contrast with the local tradition-based law adopted by the *ejido*.

By adopting *usos y costumbres* (customary law), California settlers had made the decision to determine their own civil and productive protocols. Some of the rules and traditions included the following: individual lands were assigned for cropping and household animals, collective areas for livestock, and forest activities; wood from the reserve is not authorized to be commercialized, and communities do not harvest it to sell; the agricultural and pasture lands have been more or less internally distributed per person; the areas must be rotated in terms of management and can be used again for the same purpose between 6 to 10 years later, according to local rules; the common forest on the mountain hillsides was only to be used according to family needs; and more than half of the forest territory has been kept as natural forest because it is too far for inhabitants to walk there, carry out *milpa* activities, and walk back in a day. Residents had brought fire management skills from various regions of Chiapas and use *ejido* meetings to further define village-level rules for forest management.

Villagers were never directly informed about the presidential decree regarding the nature reserve in which they and their territories were included; instead, they simply noticed the construction of a permanent encampment of the National Commission for Natural Protected Areas (CONANP for its acronym in Spanish) 1 km from the village in early 1996. Then, officers from CONANP sent invitations to authorities from California, Tres Picos, and Los Angeles *ejidos* for a series of informative meetings about the nature reserve. The meetings were meant to explain the reasons and implications for decreeing a nature reserve and the justification for building the encampment. Residents who attended these meetings were expected to inform the village about the creation of the reserve, but not directly participate in the planning of the reserve or give feedback to authorities. Their role was reduced to signing a document that officers showed them. Vicente, an elder resident present at those meetings, said: "The officers started their dialogs by saying how nice the region was, the natural scenery beauty, and their duties as part of a federal institution. They approached us with informal ease, even without knowing anything about California or us. That was the first time we had ever seen them."

Then, Francisco, one of the original California settlers, recounted: “As soon as they did not see the reaction they wanted from us, they changed their word choice and demeanor, and began to talk about sanctions as a way to threaten us. I think they tried to intimidate us. We were sure we weren’t breaking any law at all but they highlighted all the consequences, if we were to do so.” After two or three meetings, the officers vanished, until an anti-fire brigade came to extinguish a fire in a nearby *ejido*.

A brochure distributed among the communities of the reserve after the CONANP officers’ meetings stated a series of new restrictions on land use like (i) penalties for and restrictions on the use of fire in agricultural and cattle-rearing activities, (ii) intensification of agricultural areas despite of shifting cultivation, (iii) prohibition of cattle-grazing within forest areas, (iv) prohibition of wildlife hunting, and (v) prohibition on tree-cutting and any wood extraction from the nature reserve without official permission from the CONANP or authorization by the Federal Environmental Protection Agency (PROFEPA in Spanish). Because these restrictions fundamentally altered the relationship of residents to their legal territory, villagers and their representatives have grappled ever since with how to continue to live on their land without openly defying authorities.

Federal agencies seemed to withhold information from the village, arousing deep distrust. Rubén, a man in his 30s, summarized a common sentiment: “...*Actually, the nature reserve represents a burden for us. We assume the good intentions behind the area, but what about us? Are we considered to be part of or just an obstacle to the officers’ objectives? We want to hear truthful accounts and realistic proposals for the reserve, rather than just prohibiting things and looking at it as an untouchable area.*”

3.4. Fire use and its farming reasons

Periodic fire use is an important element of indigenous rotating field agriculture in Mesoamerica, as in many tropical regions around the world. In California, the rotation includes (1) a 1- or 2-year *milpa* phase, in which fields are planted with maize and several other plant crops, including squash, pumpkin, tomato, watermelon, chili pepper, *chipilín*, and several kinds of beans; (2) an intermediate *acahual*⁶ *bajo* phase in which fields are left to ecological succession, and only perennial plants such as chili and *chipilín* are harvested from the former *milpa* during 1 year; (3) a 6- to 20-year *acahual alto* phase in which fields regenerate into diverse forests of native trees and form habitats for migrating mammals, birds, and reptiles; (4) finally, most trees are harvested for timber (although several species are left standing), brush is chopped low, and the leveled plant debris is burned according to local custom—direction of the wind, the humidity, and the manual establishment of a fire perimeter prior to burning are part of this custom—to leave a rich layer of ash over fields. Into this ash, maize seeds are sown, and the cycle begins anew.

The dry coastal side of the Sepultura range has been highly susceptible to seasonal forest fires for decades. High temperatures and low humidity from December to May, as well as periodic

⁶*Acahual* is Spanish for “secondary vegetation,” a stage of natural forest regeneration.

strong coastal winds, together create high-risk fire conditions. In 1998, thousands of forest fires broke out across Mexico, including parts of the Sepultura Biosphere Reserve [22]. Especially disturbing was the fact that forest fires were found in ecosystem types where they had not previously been reported, as well as the areas more traditionally prone to fire [23]. While the 1998 forest fires were attributed to a particularly long dry season, international bodies and neighboring countries accused the Mexican government of having inadequate policies on fire prevention [24, 25]. In response, the government of President Zedillo declared that agricultural activities were the main cause of forest fires and launched the Program for Productive Conversion of Slash-and-Burn Areas,⁷ a national fast-track program to replace the use of fire in agriculture, ostensibly with green manure and cover crop technologies. In practice, however, this program has consisted in the replacement of traditional *milpa* production system with permanent-field monoculture maize (requiring intensive use of synthetic fertilizers) or other crops such as greenhouse tomatoes or the community-level replacement of agriculture with conservation payments [26].

After 1998, the Sepultura Biosphere Reserve adopted a general policy of fire suppression, including the initiation of pilot programs of Integrated Fire Management in two communities of the Reserve [23]. At the village level, this fire suppression policy has confused maize farmers who had no alternative food system to replace their swidden agriculture. State and federal policies have made communities increasingly dependent on periodic cash payments and programs.⁸ These cash transfers, combined with the fire suppression policy, have the net result of making agrarian communities more dependent on purchased food [27]. At the same time, some program's offerings such as fertilizers and herbicides, were handed out without any training on their safe and efficient use. Among peasants who had never used external inputs, this led to accumulation of the agrochemicals in their houses or experimental usage.

The Reserve's explicit vision of permanent-field agriculture surrounded by areas of conserved forest coincides with the increased use of agrochemicals, as the soil's natural fertility declines under the pressure of monoculture production and chemical inputs replace ecological processes. The health effects of these agricultural intensification processes in Chiapas peasant agriculture are often identified by farmers and researchers as serious concerns [28]. Additionally, the ecological soundness of biodiversity conservation strategies based on patches of wilderness reserves surrounded by intensified agricultural landscapes has come increasingly into doubt [29].

3.5. Highlighting the conflict: the fire backstage

In California, public display or frontstage image serves to recall shared concerns and codes of conduct. Yet, public display is only one side of village life—uncertainty, disagreement, and negotiation are also an intrinsic part of community life [30, 31]. Therefore, researchers decided

⁷Programa de Reconversión Productiva de las Áreas de Roza-Tumba-Quema

⁸Government programs such as *Prospera* (which pays mothers whose children attend school), *Procampo* or *Proagro productivo* (which pays about \$80 a year to farmers for each hectare of land that was planted with maize at the time the program started in the 1990s), and *Amanecer* (monthly payments to elders over 65 years old)

to employ ethnographic methods in order to develop a fuller understanding of the collective narrative, as well as inner tensions among the California residents.

During the first months of fieldwork, inhabitants talked openly about general problems during the workshops conducted in order to delineate the collective narrative of California. However, they felt uncomfortable talking about any “legal situation.” Further workshops then revealed tension among villagers, essentially related to an economic sanction issued to California by the PROFEPA. While conducting the participatory workshops, some participants insisted on discussing the issue, and some residents took strong positions regarding the cause of the problem. In certain occasion, a workshop became highly emotional, and some aggressive statements were made. In that sense, Cesar raised a position clearly: *“It is right, our legal problem is something that is affecting our cohabitation as inhabitants, it is actually not an ejido [collective] problem, but it is due to the actions of careless people. We know who they are -they are the responsible of the penalty- and they do have name and surnames...”*

The meeting immediately became tense, as villagers absorbed the significance of Cesar’s denunciation. Another participant, Tomás, reacted to Cesar’s statement by saying *“That is false; a penalty was imposed on the ejido, not on some specific people. What you say had happened when a resident was caught, but later on he was imprisoned and also had to pay a fine; but that is already history.”* When it became clear that there were different perspectives on the issue, the unspoken tension clouded the meeting, and researchers noted that they have spoken to in a more formal manner than in comparison with before the antecedent. The researchers therefore decided to avoid bringing up the fire issue in public spaces but instead used interviews to listen to residents’ perspectives on fire.

Days after the first meeting that revealed internal tensions in California, several villagers approached researchers with apologies and explanations for what had taken place. Semi-structured interviews showed that while residents held differing opinions on a variety of issues, they preferred that researchers should not delve directly into those issues. Carlos, in his 30s, made a direct suggestion to researchers: *“From now on, you and I are building a friendship and we can talk about whatever you like. But please, while in California do not talk about sensitive issues to anyone; be careful of approaching the right people, just to protect yourself and colleagues.”*

Francisco also said: *“I need to be careful of what I point out: the less I talk, the fewer problems I acquire. I am a very honest person, and I want to keep my life in that line. I always act in relation to what I think it must be. I respect everybody; especially since we were at risk of losing our lives during the village foundation process...”* He defended the firefighting record of ejido authorities. *“The only thing I can tell you about the PROFEPA fine is that the fire we used on our fields jumped over to an area within the natural protected area and about 10 ha of forest were burned... I normally say what I know, but you better talk to the Ejido Commissioner because he may have better and more current information.”*

The participatory workshops had provided a forum for the village to discuss the issue, but evidently it had been decided to withhold debate in such a visible setting. Residents repeatedly asked researchers if they had spoken with other key local figures, such as the *ejido* commissioner or certain elders. The interest in defusing the tension surrounding the fire and the

PROFEPA fine was clear, but villagers needed confirmation that researchers could be included in backstage conversations. As researchers began to relate elements of previous conversations they had sustained with *ejido* elders and better understand what had happened, interviewees became much more open. During the interviews, they seemed more willing to provide their opinion and retrace the events that had led to the tension with federal agencies.

3.6. Deeper into the conflict

After the creation of the nature reserve, residents decided to continue fire use within the forested areas for agricultural purposes, despite the threat of fines and jail time. Thus, it occurred that in April 2000, the driest month of the year, a first accident occurred, during an urban—rather than agricultural—use of fire. Residents had collectively decided to clear the areas around houses by slashing and burning for sanitary and safety reasons. They justified the use of fire because of the high incidence of mosquitos, as well as venomous scorpions and snakes. Suddenly, while burning, the wind changed direction and the blaze caught nearby trees on fire. About 1 ha of forest was burned, but due to the fire's brevity and limited affected area, residents did not consider possible consequences.

Eduardo explained *"We did not deliberately set fire to the forest; we just tried to protect our families. The wind moved suddenly to another direction and a spark jumped out of the fire area into the forest. We tried to combat it but unfortunately a hectare was totally burned. We tried our best but authorities punished us."* However, forest guards and rangers from CONANP were surrounding and immediately noticed the fire by the smoke presence. When they arrived to California, the fire was already extinguished. Nonetheless, after some brief talks to some villagers, they were gone. Surprisingly, after a month, the government of Villaflores municipality requested the *ejido* authorities' presence at their headquarters.

The municipal staff informed village authorities of a federal sanction of US \$2000 to be fined to the village. The *ejido* commissioner attempted to clarify the situation, but the staff argued that any claim or cancelation was not their duty, because the fine was decided by PROFEPA, the federal agency for environmental protection. The village authorities returned to California and convened to an immediate *ejido* meeting in order to inform residents and decide on the next steps. As Vicente recalled, the assembly decided that *"the fine should not be paid because California did what it could, not only to protect its population but also in terms of fire management. The fire was an accident."* The local authorities traveled back to the municipality some days later and expressed their position, verbally and in writing. To avoid problems between *ejido*, municipality, and federal institutions, the municipal staff negotiated with the PROFEPA and the CONANP officers and conciliated an agreement: the municipality would cover 10% of the sanction, but at the same time, an effort to run a reforestation plant in the affected zone had to be made. Then, the municipality proposed a series of activities within its agricultural development plan to be implemented. Thus, several young tropical trees and coffee plants were planted in the zone during 2001–2002. Nevertheless, California villagers were never told about the agreement between PROFEPA and the CONANP officers and the municipality staff—besides, none of the *ejido* officials were notified of the negotiations.

In 2002, a second accident occurred. Some inhabitants continued to use fire in order to rejuvenate grass fields, despite efforts made by the authorities to stop this traditional practice. On one occasion, two young men who wanted to stimulate grass growth for their cow herds lost control over a fire in a commonly held forest area. Sparks jumped and more than 10 ha of prairie burned, killing a few cows and burning down several nearby trees. The two men were arrested by *ejido* police and forced to pay damages according to local assessments and decisions made by the village assembly. In the local *usos y costumbres* system of justice, the offenders were forced to pay for lost grass and cows, but were not fined for burned trees. However, within a short period of time, officers from PROFEPA came and arrested the men, charging them a fine for the lost trees. The two persons were not able to pay and were forced to serve 3 months in jail. They were later released through the effort of *ejido* authorities but had to sign a document in which they promised not to use fire anymore for their agricultural activities.

Vicente, the representative of the *ejido* to the municipality at the time, was upset that the village's internal justice system had not been respected by federal authorities: *"They must go to the jail once a month and sign in as parolees; otherwise they can be re-arrested. They do not even know when they will be totally free."* He felt that California was capable of punishing them adequately for their mistake and bringing them back into the fold as normal villagers.

A third uncontrolled fire took place in May 2003, during one of the first participatory workshops conducted as part of this research. During the session, a number of children came in and alerted their parents that they had seen smoke and flames. Rapidly, the workshop participants left the hall and mixed with others who had come out of their houses. Eduardo, the *ejido* commissioner, became furious and addressed researchers: *"You see what really happens in this village, here there are still many irresponsible persons but we will punish them."* After 3 h of intensive work by more than 70 inhabitants, the fire in a 3-ha forest plot was controlled. Nobody was arrested that day by the *ejido* police. Two days later, the researchers were politely asked by Eduardo to leave California for some days in order to let him resolve the problem. A couple of weeks later, the researchers were welcomed back by the local authorities. They had completed an investigation and determined that the teenage son of a *milpa* farmer had started the blaze. He would be sentenced to carry out several periods of unpaid labor to the village, which local authorities would define on a weekly basis. California leaders had attempted to avoid penalties by PROFEPA by saying that no one had seen anyone start the fire, but officers did not believe the story and considered the *ejido* to be uncooperative.

What occurs in California's backstage plays a crucial role in local political processes, particularly for the collective management of natural resources. The third fire accident put village leaders on the defensive setup, after they had worked to show that they could manage fire without federal fines, municipal officers, and jail time. When California leaders politely expelled the research team, they made it clear that investigation and debate were in order. Such internal, collective processes of reflection—and, as a consequence, adaptation of their *usos y costumbres* system—constitute the principle use of the backstage in California. Thus, the social backstage appears to be the mechanism for evolution of local institutions, in that it provides space for discussion, negotiation, and revision without disrupting social codes or

public displays of cooperation. *Usos y costumbres* are accumulated local knowledge, so their evolution is also a process of social learning. This process probably involves combining knowledge from local and outside sources and suggests a dynamism often missing in anthropological accounts of traditional governance systems in Mexico [32, 33].

3.7. Governance frameworks: local *versus* national

Mexico's dense history of land-based social relations provides a vantage point for understanding tensions between local communities and nature reserve governance structures. Communal, territory-based agriculture and land governance characterized pre-Hispanic social systems throughout the Americas. Colonial land arrangements were designed primarily to dispossess indigenous peasants from their land, in order to harness their labor in mining and timber industries. At the same time, a majority of indigenous rural communities in southern Mexico remained intact while subject to taxes, in an arrangement called *encomienda* or *cargo*.⁹ After the independence of Mexico, large private estates (known as *latifundios* in Latin America but popularly called *fincas* in Chiapas) began to dominate the more fertile lands and incorporate dispossessed farmers as serfs. Agrarian concentration became so pronounced that by the beginning of the twentieth century, peasant discontent had reached revolutionary levels, and uprisings engulfed the nation.

Written in the heat of the Mexican Revolution, the Constitution of 1917, different forms of peasant land tenure were explicitly created: (a) social, (b) collective, and (c) small private property. Particularly, collective land tenure was relied in the *ejido*, a form of inalienable local land sovereignty. This was to be the basis for the top-down agrarian reforms that reorganized and reallocated over half the nation's agricultural lands in the 1930s [19]. The growth of the *ejido* in Mexico was the first and main widespread and institutional credit of the land's social functioning [34]. The Constitution of 1917 entitled rural communities to a degree of self-regulation of land, water, forest, and wildlife use, as described in Article 27 of the same document [35]. This clause recognized rural communities as rightful social entities in regard to the use, management, and regulation of natural resources within the territory that each village encompasses [36]. As a political unit, *ejidos* were both the basis for self-rule by peasant communities and clients of the Mexican ruling political party [37].

In the 1980s and 1990s, the Mexican government's previous strategy of rural development was dramatically reversed as the country's leaders embraced the "free market" model. By adopting such a model, they ended a period of decades of guaranteed prices for staple crops, officially discontinued agrarian reform, and shifted subsidies from peasant agriculture extension services to export-based commercial agriculture. While this "retreat from the countryside" was felt across Mexico, it was in fact an asymmetrical policy shift, as large subsidies for new specialized farms appeared in the northern states, and new programs for cash transfer poverty mitigation and natural resource conservation were introduced almost simultaneously in southern Mexico [38]. As a general trend, *ejido* dwellers became increasingly dependent on various

⁹*Encomienda* and *cargo* are the Spanish words for "assignment," "task," or "duty."

kinds of poverty mitigation payments, which replaced agricultural production as the primary source of income in rural Mexico [39].

In areas where traditional political systems remained in place throughout the existence of the Mexican nation, communities were given the option to maintain or adopt local governance systems based upon *usos y costumbres*. These local codes and laws based on customs were thus officially recognized by the national state and municipal legal systems [40]. One of the purposes of customary laws—as the *usos y costumbres*—is not only to regulate the village's common use of natural resources like forests, soil and water based on local values, justice, and usage patterns but also to sanction by tradition when necessary improper social acts and faults. According to [9, 32, 33], it can be considered not only as a unifying mechanism for people and organize their expressions of collectivity throughout the use of natural resources but also as their political life and decision-making processes.

Nevertheless, Mexico's jurisprudential system consists of federal laws applicable at every lower administrative level: states, municipalities, and small communities (**Figure 3**). The laws of the top-down system are based on the *individual form* of proper behavior to ensure social order, as considered by protagonist elements of Mexican society. On the contrary, *usos y costumbres* are based on *collective practice* of daily life in California. Hence, many environmental and rural policies run contrary to local strategies of resource use, as validated by local governance systems and practiced in thousands of rural communities [41]. The failure to develop national policy that corresponds with local perceptions of risks and environmental stewardship is a result of contradictory visions on the Mexican countryside. As a consequence, environmental policies such as those with regard to nature reserves are a source of conflict in places where reserve creation is perceived as a state-led enclosed area, meant to exclude human activities, thereby excluding people from their means of survival [42].

National policy over the last couple of decades has increasingly put land and natural resources into inflexible categories of being either available to the market or not available to anyone [43, 44]. When federal environmental agencies applied punitive measures to California as a whole, the *ejido* remained unified and sharpened its collective distrust of the federal legal system. Punishment to individual members, such as the young men who served jail sentences, had the effect of dividing California. This could be due to the federal legal system's a priori distinction between "good" and "bad" practices, which threatens the California's understanding of its own relationship with common resources. Village self-governance, a central aspect of the postrevolutionary social order, has never been fully integrated into conservation strategies [26].

4. Additional discussion

The tension created by the conflict over fire reflects larger debates over forest fires, biodiversity conservation, and agricultural development in the tropics. Conservation theory has frequently dichotomized land use into two divergent models with high trade-offs between them: conservation for biodiversity and agriculture for development. During the last two decades, neoliberal



Figure 3. Ruling frameworks for natural resource usage and space of conflict in Chiapas (Chiapas, Mexico).

theory has achieved an integration of conservation and development discourses, in forest transition theory [45, 46].

Proponents of forest transition theory suggest that capitalist development in several former colonies has led to increased forest cover, as rural out-migration and increasingly productive industrial agriculture have reduced pressure on agrarian frontiers. Following this logic, the best way for Mexican conservation actors to transition the country from net deforestation to net reforestation would be to implement a twofold strategy: agricultural intensification and a decrease in the agricultural use of forested lands [47]. However, there is a body of ecological theory that challenges forest transition theory and explores the need for larger, landscape-scale conservation strategies that incorporate debates on forest and agricultural models.

Parallel to this theoretical development, many empirical studies have shown a wide array of agroecosystems with biodiversity comparable to natural ecosystems. The agricultural matrix, or cultural-spatial context of nature reserves with vast forested areas, is the key to population survival in this conservation perspective. Therefore, sustainable forest management and small-holder agriculture in the tropics, focused on subsistence and often involving minimum transformation of natural ecosystems, can play a key role in providing biological migration services to the patches of forest that it surrounds.

In ecological terms, the implications of forest fires *versus* landscape matrix debate are essentially a question of whether maintaining large undisturbed habitat patches (such as nature reserves) is more or less important to biodiversity conservation than maintaining high-quality land use between smaller patches of undisturbed habitat. However, both possible answers correspond to two distinct visions of development. Mexico has been an exemplary case of transition to a free market economy, and although rural out-migration has been dramatic, deforestation continues to be the trend [20]. The potential of peasant farmers' *milpa* and *acahual* to serve as migratory corridors and temporary habitat for diverse species has not yet been studied in the Sepultura Biosphere Reserve, neither by government biologists nor external researchers.

5. Concluding remarks

The federal governance system is characterized for its top-down approach, therewith imposing a framework of normative laws that are often badly tuned to local situations [48]. While federally created environmental laws are designed to protect against misuse of vulnerable natural resources, or the use of fire, they are often a source of conflict at the local level [49]. The intimidating character of federal laws, the routines imposed by the *usos y costumbres*, and the lack of local productive opportunities and options have put natural resources at risk and created social tensions, especially by the use of fire in forested areas. It is not surprising, therefore, to find an apparent rise in the illegal use of commons and the breaking of environmental laws in California.

In the relationship between normative and actual behavior, the point of tension became the two frameworks for local practice. The contradictions between the federal laws and the *usos y costumbres* have led to constant misunderstanding of settlers' intentions by municipal and especially federal agencies, as well as the sense of betrayal and abandonment that inhabitants felt. While these relationships have impacts upon the natural resource use and village cohesion, solutions will not be found in technological packages or training, especially those that emphasize the use of fires in forested areas at the level of the individual producer. The traditional crops and cultural practices of California's agriculture form an underlying collective logic that pervades local identity even beyond the cultural use of fire.

Village involvement in biodiversity conservation would require that institutions become capable of learning from peasant traditions rather than only approve or restrict them. Given the trends associated with global climate change in the Sepultura Biosphere Reserve, fire use may be becoming more dangerous and as such could require additional capacity building. However, at a political level, these lessons in coexistence of the two governance systems have yet to become operational in the Sepultura Biosphere Reserves of Mexico. The continued dichotomization of agriculture and conservation obscures sincere efforts of sustainable development, leading to the creation of misguided conservation policy that alienates peasant communities. This can especially have counterproductive effects, as the rural communities are the crucial ally in society's efforts to defend and preserve nature.

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