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Fighting a forest fire at night in Chiquitania. Photo: FAN

Community-based fire management in Bolivia: integrating people, knowledge and good practices

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“Community-based initiatives are clearly the answer, but they need to be adopted in national policies, commitments and instruments.”

Introduction

Bolivia has some of the greatest biological diversity and forest cover in the world, but is also one of the countries most threatened by deforestation and forest fires. This threat is closely related to accelerated land-use change for agricultural expansion, increasingly harsh dry seasons and climate change.

Historically, the country has experienced large fire events coinciding with years of severe drought, such as in 2004, 2010, 2016 and 2019. Over the past 20 years, the annual area burned has averaged around 3.7 million hectares (ha), with an all-time high of nearly 10 million ha in 2010. In 2019 nearly 6 million ha were affected by fires across the country. Almost two-thirds of the burned areas comprise non-forest cover such as grasslands, shrublands and farmland, while one-third is forest, mostly Chiquitania and Amazonian forest types in Santa Cruz Department (FAN 2019; FAN and WCS 2021).



Agricultural burning in the Chiquitania landscape during the forest fire season. Photo: FAN

The main causes of fires in Bolivia are associated with agriculture and livestock farming, by both small and large producers. In indigenous communities, the use of fire is mainly related to clearing small productive plots and renewing fallow land, and in livestock activities and hunting, where it is a traditional practice that incorporates knowledge of local conditions. Fire is also widely used in large-scale livestock farming for pasture renewal and pest control, and in mechanized commercial agriculture to clear large tracts of land, which in many cases can cause forest fires. This is compounded by the increasing pressure of human settlements on forested areas, by regulations and development plans that favour land conversion for agriculture, and by the impacts of climate change.

Fire has always been part of the dynamics of Bolivia's forest landscapes. However, the increasing frequency and intensity of large fires is threatening the sustainability of ecosystems and the livelihoods of vulnerable communities, mainly in the Chiquitania region of Santa Cruz Department. This area has the largest and one of the most biodiverse tropical dry forests in the world, one with historical and cultural importance. Due to its transitional location between the tropical forests of the Amazon, the Gran Chaco and the Pantanal, the forest in the region is fundamentally important for maintaining ecosystem connectivity. The region connects almost 12 million ha of protected areas and conservation spaces with great value to humanity. In recent decades, however, there has been an accelerated change in land use for agricultural and livestock expansion and in new

settlements, both of which are leading to increased deforestation and burning.

A holistic approach to forest fire management

In Bolivia, as in other countries in the region, a reactive approach to fire still predominates. It focuses on the negative aspects of fire, with policies aimed primarily at firefighting and suppression, and with coercive and punitive legal measures. However, the effectiveness of such approaches has been very limited for several reasons. These include a lack of knowledge of the social and ecological context in which fires occur, a lack of control and participation in decision making at the local community level, and the fact that implementation is subject to the limited capacity and resources of relevant government institutions (Ibarnegaray et al. 2014).

Over the last decade, the Fundación Amigos de la Naturaleza (FAN) has been taking a holistic approach to fire management as a nature-based, community solution to reduce risks and improve the resilience of vulnerable ecosystems and communities. Community-based fire management incorporates local participation as its basis (FAO 2011). The approach considers and integrates ecological, cultural, socioeconomic and technical aspects in strategies and practices for the prevention, use of fire, and control of forest fires. It includes the active participation of a variety of local actors, including public, private and non-governmental institutions working in land management.

Community fire-management programmes

FAN's pilot Community Fire Management Programme started in 2011, with the goal of climate change adaptation and forest fire risk reduction for communities and protected areas in southeastern Chiquitania. It was one of the winning proposals in the World Bank's global Climate Change Adaptation Development Marketplace competition in 2009. Its innovative and participatory approach aims to integrate monitoring and early-warning tools in fire management, with the active involvement of local communities.

FAN implemented this initiative for four years, working with 36 indigenous and peasant communities and three Mennonite colonies around protected areas in Laguna Concepción, Santa Cruz la Vieja and Tucabaca, in the municipalities of Pailón, San José de Chiquitos and Roboré in Santa Cruz Department. Between 2013 and 2018, the initiative was replicated in the northern Amazon region with support from the MacArthur Foundation, involving a further 15 communities in the municipalities of Riberalta (Beni) and Puerto Gonzalo Moreno (Pando). In 2018, FAN resumed activities in southeastern Chiquitania, with the European Union (EU)-supported ECCOS project. Since 2020, FAN has expanded its interventions to northern Chiquitania, in 10 communities in Concepción, San Ignacio de Velasco and Lomerío, with support from GIZ, and in the Bolivian Pantanal, supporting ANMI San Matías and Otuquis protected areas, in collaboration with WWF.

Over the last 10 years, FAN has consolidated its fire management actions into a strategic programme. Through the programme it promotes the development of research, tools and capacities to improve forest fire management practices and policies in Bolivia, with the aim of contributing to the resilience of vulnerable ecosystems and communities. FAN is currently working with 30 indigenous and peasant communities, local governments, social organizations and protected areas in the Chiquitania and the Pantanal, through various projects co-funded by international cooperation agencies of the EU and the USA.

Preparing communities to live with fire

Work with communities is oriented to local efforts to prevent and prepare for the risks of forest fires. Through training, technical assistance and participatory planning, FAN supports improved fire management practices, including monitoring of fire risks, planning and execution of controlled burns, early warning measures, and community-based first response.

Participatory monitoring

Communities actively participate in management and monitoring, supported by geospatial tools and information and communication technologies. Through participatory mapping exercises using high-resolution drone and satellite imagery, local people study and analyze their territory, establishing a zoning system for sites of great importance to conservation, protection



Forest fire in a Chiquitania forest. Photo: FAN



Prescribed burning for fuel reduction in grasslands in the Tucabaca protected area. Photo: FAN

and production. They also assess fire risks in order to improve land-use and fire management planning and management in a way that considers their livelihoods. Information on land use, production systems, fire-use practices and fire risks is recorded through the use of smart phones and mobile applications. Each community in the programme's pilot areas has dedicated fire management delegates who are trained and equipped to register georeferenced field data in digital formats designed for this purpose. They also monitor data and coordinate with community members to inform and support decisions and action planning related to land use and risk reduction. In this way, communities are provided with information and monitoring tools to guide the management of their territory in a more efficient and sustainable way.

Controlled-burning calendars

Recording information on productive practices and fire use allows communities to plan and coordinate the execution of agricultural burns through developing controlled-burning calendars. They also receive training and participate in exchanges of technical and traditional knowledge on the application of controlled-burning techniques, and on the legal procedures for complying with regulations related to the use of fire and land. Burning schedules are planned in a participatory and consensual manner by community members and are posted in conspicuous places. This facilitates monitoring and community coordination of the execution of burns under controlled conditions, which includes safety

measures to reduce the risk of a burn turning into a forest fire.

Early warning

The communities have established early-warning measures to help address fire risks. They include measuring, monitoring and communicating weather conditions through portable meteorological instruments and warning signs installed in strategic locations. Daily measurements taken by community delegates help determine the level of fire danger and alert the community when people need to take preventive measures to reduce risks, such as prohibiting burning on high-risk days.

First-response brigades

Local first response is crucial to preventing the spread of fires. FAN has trained and equipped first-response brigades in more than 50 communities in the Chiquitania and the Bolivian Amazon. These brigades provide rapid response and support in fighting and extinguishing forest fires, and their knowledge of the territory is key to the success of the operations.

Strengthening institutions that manage forest fire risk

Protected areas and municipalities face major challenges in managing risk and fires; they have few resources and limited technical and logistical capacities. FAN has provided technical assistance in fire monitoring and early

warning in 10 municipalities and seven protected areas, and has also facilitated access to geospatial tools and information. In addition it has strengthened response capacity through training, equipment and technical and logistical support for firefighting to park rangers, municipal technicians and local volunteer firefighting teams.

Integrated fire management plans

FAN promotes the development of integrated fire-management plans in protected areas and indigenous territories as a management tool for the conservation and protection of biodiversity and local livelihoods in the face of forest fires. This includes the organization, planning and implementation of strategic actions that integrate the ecological, social and technical aspects of fire management with a landscape vision. The first integrated fire management plans in Bolivia have been developed for the protected areas with highest fire occurrence in the Pantanal region: Otuquis National Park and Integrated Management Natural Area (ANMI) and San Matías ANMI.

This approach has also been used for the Chiquitano Indigenous Territory Monte Verde, in the framework of a collaborative process by various actors of the Indigenous Territorial Government and community authorities, as well as experts and technicians from cooperating organizations. The aim is to strengthen local management capacity and contribute to

the sustainability of community livelihoods, forest conservation and ecosystem function.

Fire ecology and prescribed burning

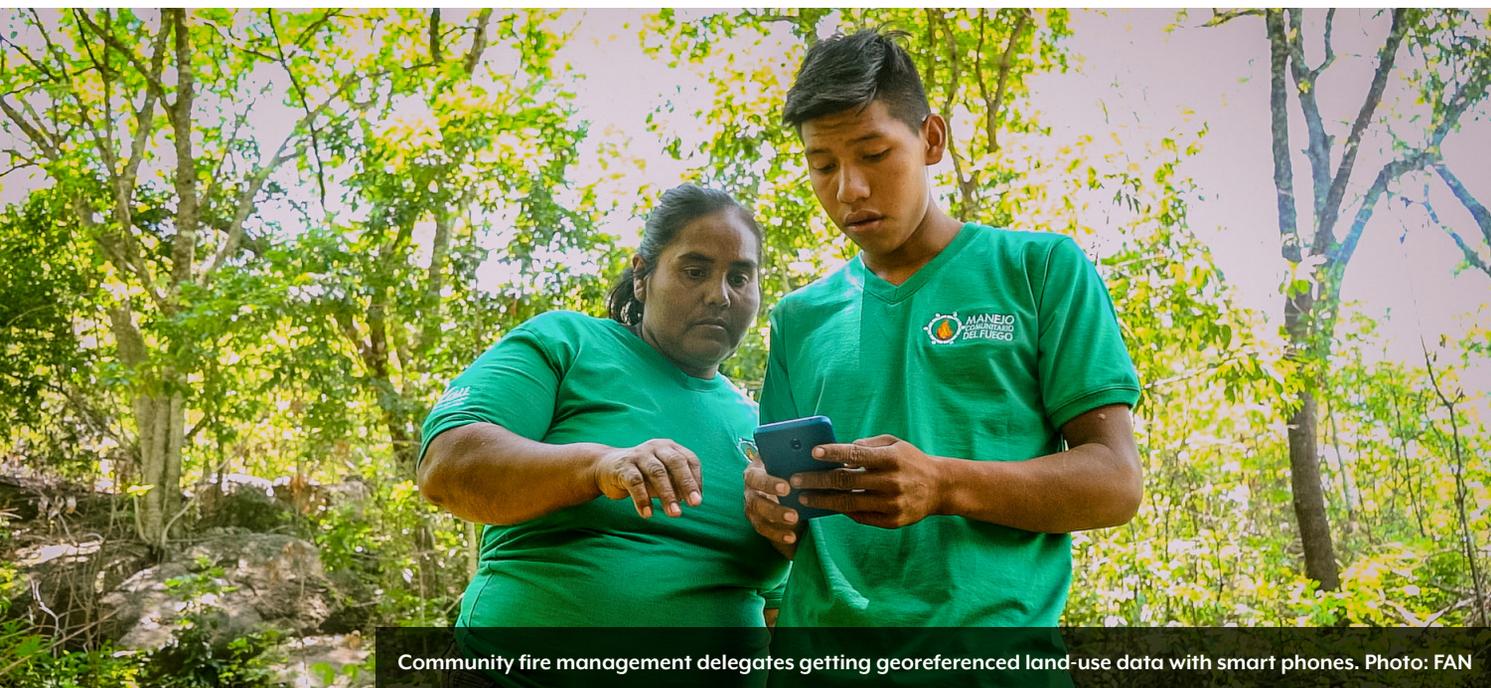
Research on and knowledge of the role of fire and its impacts on ecosystems support the development of landscape management strategies that are based on risk prevention and reduction. FAN has piloted prescribed burning in protected areas and nature reserves as one such strategy. The aim was to carry out low-intensity burning under specific and controlled conditions to reduce forest fuel and vegetation susceptible to burning and, consequently, to reduce the danger of fire spreading to sites with high biodiversity. This measure was first implemented in 2014 in the Tucabaca Natural Heritage Conservation Unit and protected area, and has been replicated by the Governorate of Santa Cruz within its departmental fire management programme.

Monitoring of forest fire risk

FAN has developed a forest fire risk-monitoring and early warning system called SATRIFO (Sistema de monitoreo y alerta temprana del riesgo de incendios forestales). This generates and disseminates information and geospatial tools to support and guide fire-management strategies and actions with a regional and national scope, and contributes to the various stages of fire risk management. Information includes fire risk analysis and forecasts that are based on a model that combines climatic and environmental variables. This allows users to generate



Developing a communal controlled-burning calendar. Photo: Stephen Reichle/FAN



Community fire management delegates getting georeferenced land-use data with smart phones. Photo: FAN

daily fire risk maps for the whole country, which in turn supports fire prevention and early warning. The system also provides data for monitoring of prescribed burns and active fires in order to determine response actions, and to evaluate the severity of fires and the damage to burned areas to guide restoration and management strategies. The information is available on an interactive web portal map and the SATRIFO mobile app to facilitate consultation, download and analysis. It includes dynamic and interactive mapping tools, reports and customized alerts. In more than 10 years of operation, SATRIFO has positioned itself as a source of information at the national and international level, through which it has supported the strengthening of institutional capacities for monitoring forest fires in Bolivia.

Information and social awareness

Exchange of information about and experiences in fires and fire management is fundamental to raising awareness and to involving society as a whole in the search for solutions that generate positive social change. FAN has developed communication materials for a range of audiences, and has promoted discussions among the scientific and academic community, authorities and civil society to broaden and improve the scope of its interventions.

Conclusions

Integrated fire management requires joint and coordinated efforts between government, civil society

and local communities. Although FAN's initiatives have succeeded in achieving participation and collaboration by a range of actors — from the community to regional and national levels — this coordination is weakened and influenced by the complex sociopolitical forces in Bolivia.

Local communities are assuming an active and responsible role in fire management. However, stronger partnerships and technical assistance are still required to consolidate good practices, mainly those related to the use of and access to information and communication technologies. This presents an opportunity to target digital inclusion policies that provide incentives to local communities to strengthen early warning and risk-reduction mechanisms.

Forest fires have garnered a great deal of media attention in the wake of the 2019 fires, which have worsened the social rejection of the use of fire and everything related to fire as a land-management tool. This makes it even more difficult to argue for fire's usefulness in conservation purposes. The development of prescribed burning has great potential, but many challenges and barriers need to be overcome in order to demonstrate its effectiveness and benefits so that it can be recognized and incorporated as a good practice within strategies and plans for conservation and risk management.

There is still a long way to go to achieve a real transformation in the way that fires are understood and managed in Bolivia, so that policies that address land management and fire management have a holistic

and landscape-level vision. The sustainability of good practices and community fire-management initiatives will depend to a large extent on their recognition by and appropriation within governance structures and mechanisms, from the local to the national level.

The interactions between climate change, ecosystems (including their biodiversity) and human society are becoming increasingly evident and at the same time more complex and more difficult to manage. While community-based fire management initiatives offer the opportunity to move towards the development of synergistic strategies for natural resource management and conservation, risk management and climate resilience, these strategies have not yet been incorporated into the relevant commitments, policies and instruments.

Enabling conditions are key to implementing, accelerating and sustaining integrated forest fire management in Bolivia. These include political commitment and follow-up, institutional frameworks, policies and instruments with clear goals and priorities, increased knowledge of impacts and solutions, mobilization of and access to adequate financial resources, monitoring and evaluation, and inclusive governance processes, all of which are still in an incipient state in Bolivia.

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