

Latin American Strategy for Strengthening Fire Management Education¹

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Abstract

Central America, Mexico, the Dominican Republic, Colombia, Venezuela and Peru are projected to experience an increase over the short term in the number of recorded wildfires and area affected, accompanied by an obvious loss of housing units, infrastructure and in extreme cases human lives. Hence, there is an indisputable need for Wildfire Protection and Fire Management to be assumed responsibly and on an academic basis by professionals in forest and related sciences in Latin America, which necessitates the adoption and development of a "Latin American Strategy for Strengthening Fire Management Education 2017-2023 (ELFAMF for its initials in Spanish). This initiative aims to address from the outset the demand for: establishment of training and updating approaches and actions for university and vocational training center teachers; inclusion of Fire Ecology and Effects and Fire Management courses in the curriculum; development of didactic teacher's, student and field practices manuals; establishment of permanent pilot research units, workshops and forums for updating and results analysis, joint collaboration agreements for teacher and student exchange and mobility, and teacher training programs. The results of the strategy will generate greater interest and a broader capacity for decision-making in research, development, operation, economics and evaluation of fire protection and management programs by forest and related professionals at the national level in protected natural areas, areas with environmental services, plantations, forest management areas, wildlife management areas, watershed and reservoir protection areas, areas with cultural resources, recreational areas and rural units, among others. With actions such as these, each of the countries will be addressing in the short and medium term, on a scientific and ecological footing, what is set out in their current forestry regulations, and indicated in the Guidelines on Forest Fire Management in Temperate and Boreal Forests (FAO 2002); Fire Management: Voluntary Guidelines (FAO 2007) and the Regional Fire Management Strategy for Central America and the Dominican Republic 2015-2025 (CCAD 2015).

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Introduction

Globally, an increase in the recorded number of wildfires and area affected is projected over the short term, coupled with the obvious loss of infrastructure, housing units and human lives.

Latin American countries such as Mexico, Guatemala, Honduras, Colombia, El Salvador, the Dominican Republic and Peru, among others, and very soon Panama as well, are currently working on wildfire protection and fire management programs, mainly as a result of the emergencies they have experienced in recent years. This situation demands the creation and development of a national strategy for protection against wildfires and fire management to be addressed operationally in a responsible and academically-based manner by professionals in forest and related sciences.

In this field, science, technology and interdisciplinary research are aimed at improving our knowledge of complex processes and fire-atmosphere-climate interactions. Support is required to establish and continue these investigations and promote interaction among these fields, which is fundamental if the technical community engaged in and responsible for fires and fire management is to advance in terms of new knowledge, instruments and technologies (FAO, 2006).

Research and transfer of scientific knowledge through university-level vocational teaching is fundamental to implement and put into practice advanced fire management. Public education is essential for fire prevention and, above all, for fire management actions such as ecologically reliable and safe burning techniques (FAO, 2006).

However, the current state of the universities and higher education centers in Latin America that train and produce the professionals have neither trained teachers nor curricular subjects on fire ecology and effects, which provide the necessary grounding in the field of fire management, which would allow graduates to meet the demands of wildfire protection and fire management in their country. The foregoing requires the adoption, development and evaluation of a Latin American Strategy for Strengthening Fire Management Education 2017-2023 (ELFAMF), taking into account that five years are normally required for curricular reform in university degree programs. This initiative ensures that from the outset the lack of knowledge, practices and professionalism of the technicians responsible for the implementation of National Fire Management Strategies in each of the countries is addressed.

Reference framework

Conceptual framework

Fire management is the discipline aimed at using fire to achieve traditional land-use management and objectives along with the protection of life, property and resources, through the prevention, detection, control, restriction and extinction of fires in forests and other types of vegetation in rural areas. It includes programmed and naturally generated fires, and comprises research and technology transfer (FAO, 2006).

Integrated fire management includes the integration of science and society with multilevel fire management technologies. It considers a comprehensive, holistic approach to deal with fire-related issues, taking into account biological, environmental, cultural, social, economic and political interactions (Kaufmann et al., 2003).

The term "integrated" has been used to describe other natural resource management approaches, such as "integrated forest management" or "integrated community development." It is generally held that "integrated" concisely describes the state of synergistically gathering various concepts and issues to produce effective results that cannot be achieved by technology alone (Myers, 2006).

It is considered that in its initial application phase in fire management, it was explained with this differentiation, that the application of fire management strategies and actions would have to consider the integrated scenario, which is why the term "integrated" is ingrained in fire management.

Wildfire protection consists of pre-suppression strategies and actions, prevention which includes education, outreach and prediction, detection, combat, liquidation, rehabilitation and fire use by controlled burns, black lines and prescribed burning tests, which are carried out within a national program (Nájera, 2016).

Fire Management takes into account the development, monitoring and evaluation of the strategies and actions that are carried out in the Wildfire Protection Program, including fire use strategies and actions as an ecological management tool, research on fire ecology and effects, in the context of benefits and damages, and the socioeconomic and cultural environment of society (Nájera, 2016).

The above indicates that we are in the transition stage from wildfire suppression to fire management.

Institutional framework

In general, all countries have an agency at the institutional or ministerial level that includes the forestry sector and natural resource conservation and development, which is responsible for regulating, operating and addressing wildfire protection and

fire management. However, there is also usually a delegation of this function to mainly Fire Departments, the Armed Forces and Protected Natural Areas, institutions and agencies that were created with another mission and primary responsibility. However, it is generally here where professionals who have graduated from educational institutions work as public officials in charge of wildfire protection and fire management; because of their curricular training, they usually do not have the main knowledge bases and practices to address the fire management issues facing their institution.

Political and legal framework

In recent years, Latin American countries have included wildfire fighting in their national policies; some of them are in the process of developing a National Strategy for Protection against Wildfires and Fire Management, a process that marks the transition from firefighting to fire management.

This represents a weakness, since there is no significant economic support for the national fire protection and fire management programs of Central America and the Dominican Republic (CCAD, 2015).

Currently, the Regional Fire Management Strategy for Central America and the Dominican Republic, 2015-2025, is in place; it outlines the strategic lines, objectives, components, actions and activities to be carried out in fire management (CCAD, 2015).

Usually Latin American countries have a Forest Act and its Regulations, or a Forest and Wildlife or Protected Natural Areas Act, an Act for the Conservation and Development of Natural Resources, and in particular cases, the regulations are complemented by Official Rules, which indicate who is responsible for regulating, coordinating, operating and evaluating wildfire protection and fire management.

Background

In the late 80's, Mexico began within the framework of the Memorandum of Understanding between the United States and Mexico, through coordination with the Forest Service (USDA FS) and the then-Secretariat of Agriculture and Water Resources (SARH for its initials in Spanish), a series of training and technical assistance lines and actions in the field of wildfire protection, in which technical staff from other Latin American countries participated; this situation is still in force today, with adjustments and strengthening to fire management.

In Central America, with Mexico's leadership and support, in the 1990s the Republic of Guatemala served as the headquarters for the training of technical staff from

Central American countries in Mesoamerican Wildfire Protection courses (ICF-CONAFOR- USDA FS- USAID, 2014).

Currently, Guatemala and Honduras have their own technical assistance and training process in the field of wildfire protection and fire management, achieving progress mainly in the formation of their own national team of instructors and wildfire control centers. For their part, Colombia, Peru, the Dominican Republic and possibly Panama have begun the USFS consultancy process to develop their own National Fire Management Strategy, being appropriate to consider community development, traditional fire use and the latter's relationship to the causes of fires to meet local needs and provide technical assistance and regulatory support for the application of fire, thereby leading new generations of peasants towards fire management.

Justification

It is important to mention that the actions undertaken in Mexico and other Latin American countries, as part of the strategies, lines and actions carried out in wildfire protection and fire management, do not provide for the academic strengthening of teachers who give topics related to these subjects; it is therefore necessary to develop and adopt a "Latin American Strategy for Strengthening Fire Management Education" 2017-2023 (ELFAMF). This initiative aims to address from the outset the demand for: establishment of training and updating approaches and actions for university and vocational training center teachers; inclusion of Fire Ecology and Effects and Fire Management courses in the curriculum; development of didactic teacher's, student and field practice manuals: establishment of permanent pilot research units, workshops and forums for updating and results analysis, joint collaboration agreements for teacher and student exchange and mobility, and teacher training programs.

The results of the strategy will generate scientific bases and derivations for decision-making in research, development, operation, economics and evaluation of fire management programs by forest and related professionals at the national level in protected natural areas, areas with environmental services, plantations, forest management areas, wildlife management areas, watershed and reservoir protection areas, areas with cultural resources, recreational areas and rural units, among others. With actions such as these, each of the countries will be addressing in the short and medium term, on a scientific and ecological footing, what is set out in their current forestry regulations, and indicated in the Guidelines on Forest Fire Management in Temperate and Boreal Forests (FAO 2002); Fire Management: Voluntary Guidelines

(FAO 2007) and the Regional Fire Management Strategy for Central America and the Dominican Republic 2015-2025 (CCAD 2015).

Strategic framework

Vision

Address and develop in Latin America national fire management policies, regulations and strategies, from the teaching and training of forestry and related science professionals.

Mission

Strengthen fire management at the Latin American level, by teaching support and curriculum formation strategies and actions to ensure optimal professional performance for the protection, conservation, management and development of natural resources and wildlife, within the framework of community and societal development.

Overall objective

Implement strategies, lines and actions to strengthen teaching and curriculum formation in fire ecology and management for the development, operation, research and evaluation of the national fire management strategy. .

Specific objectives

Socialization and implementation of the "Latin American Strategy for Strengthening Fire Management Education" 2017-2023 (ELFAMF).

Strengthen the institutional teaching staff that gives the subjects related to wildfires and fire management, including them in training and updating programs that are carried out in the tiered experience-grading system used in fire management in each country.

Establish, as part of the curriculum development of degree programs in forest engineering and related sciences, compulsory Fire Ecology and Effects and Fire Management subjects, preferably in the final semesters.

Develop didactic materials such as teacher's, student and field practices manuals, as well as lectures on fire ecology and effects and fire management.

Institute the establishment of permanent "pilot" research units with different management objectives, in ecology and evaluation of the effects of fire on fire-maintained ecosystems and protected natural areas.

Formalize the holding of national and international forums and workshops to present strategy updates, progress and results.

Manage and consolidate the signing of joint collaboration agreements between national and international universities and vocational training centers for the exchange and mobility of teachers and students.

Carry out the monitoring and evaluation of the strategy to measure the level of progress in terms of results and the fulfillment of the established objectives, adjusting the established actions to achieve the proposed mission and vision.

Strategic lines

Strategy implementation

Actions

Apply for the inclusion of the ELFAMF in the training and technical assistance activities that the USFS IP currently carries out in the country.

Formalize the consent of the USFS IP and the national government for the development of the ELFAMF jointly and in coordination.

Adapt and reproduce the ELFAMF for its socialization in the educational institutions and countries with which USFS IP works for its implementation.

Draw up and obtain approval of the annual operating plan by institution and country for implementation of the ELFAMF.

Teacher training

Actions

Request on behalf of the university or educational center that the agency responsible for conducting training in fire management in each country allocate 1 to 2 places for teacher and assistant attendance.

Attend and pass courses taught by the USFS IP and the national government covering fire management, the Incident Command System (ICS), fire behavior and prescribed fires at the basic, intermediate and advanced levels.

Maintain coordination with the agency responsible for responding to wildfires and carrying out prescribed fires in each country and attend combat and ignition application technique actions to gain practical experience.

Maintain good health and physical fitness, necessary to perform arduous tasks

safely in the fire and fire management areas.

Curriculum development

Actions

Generate in a timely and appropriate manner the support, justification and analytical programs to include the fire ecology and effects and fire management subjects in the curriculum and initiate the relevant procedures.

Formally request that the academic affairs office or the academic vice-president's office of your educational institution include, as compulsory subjects in the forestry engineering or related science degree programs, the fire ecology and effects and fire management subjects.

Consider the January-June semester to impart fire ecology and effects and the July-December semester for fire management, in agreement with the regulations, and report the approval of the two subjects in the curriculum, final semesters and the professional career programs that decide to teach them.

Didactic materials

Actions

Develop and reproduce didactic materials such as the teacher's, student and field practices manuals for the fire ecology and effects and fire management subjects.

Design PowerPoint lectures on the two subjects for use with a multimedia projector, combined with interactive DVD materials to reinforce the subjects.

Establish an area for field practices, fuel assessment, ignition tests and application of case studies.

Request funding for the acquisition of personal protective clothing, hand tools, and materials and equipment used for firefighting and conducting prescribed burn tests.

Pilot units

Actions

Develop research lines and specific objectives in different ecosystems, prioritizing protected natural areas, commercial plantations and areas with environmental services.

Establish, in different ecosystems, "pilot" research units on fire ecology with different management, conservation, development and protection objectives.

Carry out monitoring and evaluation in the pilot units on the effects of fire on pests, plants, forests, grasslands, scrub, soil, water, air, wildlife and cultural resources, among others.

Establish "pilot" community development units to provide attention and follow-up to fire causes, technical assistance for traditional fire uses and the adoption of community fire protection and fire management activities.

Institute a university research or community development project to obtain the funds and resources necessary for research and/or community development of fire management, in which the institution's Forest Fuel Management Team, composed of students and coordinated by teachers, is formed.

Forums and workshops

Actions

Organize and lay the foundations for the holding of national and international forums in coordination with the national government to analyze, report on the progress and results of the actions carried out in each country and share experiences with other countries.

Organize and justify the holding of national and international Workshops in coordination with the national government for training and updating in the field of fire ecology and effects and fire management.

Agreements

Actions

Formalize the drawing up and signing of inter-institutional joint collaboration agreements between universities and centers of higher education at the national and international level, prioritizing wildfire protection and fire management actions.

Develop, within the framework of general agreements, student and teacher exchange and mobility agreements, focusing on research activities related to fire ecology and effects and fire management.

Strengthen international linkage in the fire management area in terms of teaching, research and community development.

Monitoring and evaluation

Actions

Schedule and perform the monitoring and evaluation of the strategy, measuring the progress achieved and the achievement of objectives to fulfill the mission and vision of ELFAMF.

Establish and operate the National Fire Management Teaching Team (ENDMF for its initials in Spanish) in each country to carry out the evaluation of the strategy based on the annual plan proposed by each institution.

Appoint an International Fire Management Teacher Coordinator (CIDMF) to strengthen the organization's logistics and the evaluation of the actions to be carried out as part of the ELFAMF.

In regards to the seeking of Economic Resources for the implementation of ELFAMF, each university or center of higher education will schedule its actions based on its annual operating plan and will agree on contributions from national governments and international agencies for participation, research and exchange of experiences; in addition, these educational institutions must report the results of these activities. Implement, formalize and develop the first stage of the ELFAMF in the countries of Belize, Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica, Panama and the Dominican Republic.

Strategy implementation

The implementation of the Latin American Strategy for Strengthening Fire Management Education (ELFAMF) 2017-2023 has, as its integrated development core, the training and technical assistance support program provided by the United States Forest Service (USFS) mainly in the countries of Mexico, Honduras and Guatemala; under it, the University and/or Higher Education Centers of each country will establish contact and arrange with the National Agency responsible for conducting training in the field of fire management, namely the National Forestry Commission (CONAFOR-Mexico), National Institute of Forest and Wildlife Conservation (ICF-Honduras) and the National Forestry Institute (INAB-Guatemala), the allocation of at least two places to attend training courses in the NWCG fire management scheme being carried out in the country. It is also advisable to seek funding from the national office of USFS International Projects for teachers to attend training events that are carried out in coordination with the national governments.

Universities and/or centers of higher education in each country will request internal and external resources, through the implementation of national and international projects to strengthen the ELFAMF counterpart, and conduct teacher-training, carry out curriculum development by including compulsory subjects,

generate didactic materials, set up “pilot” research units and for community development, form the institutional fuel management team, coordinate and host evaluation and updating forums and workshops, bring about the signing and development of joint national and international collaboration agreements and coordinate with national institutions and international agencies to carry out and host the annual evaluation of the ELFAMF in each country.

Each university and/or center of higher education must carry out its annual operating program of activities and submit a report on activities, results, and progress to the representatives of the National Fire Management Teaching Team (ENDMF) and the International Fire Management Teacher Coordinator (CIDMF), who in turn will inform the pertinent national government institutions and international cooperation agencies.

With ELFAMF advances and results in each country, a theoretical-practical professional strengthening, improvement and growth is guaranteed, which ensures that the national fire management strategy is carried out by forestry and related science professionals who are officials and managers responsible for staff safety and regulatory, operational, community development, and fire management assessment actions.

The demand for the design, development and evaluation of Fire Management Plans to reinforce the Management Programs of protected natural areas, areas with environmental services, commercial plantations, forest management areas, wildlife management areas, watershed and reservoir protection areas, areas with cultural resources, recreational areas and rural units, among others, necessitates research, community development and their economic and operational evaluation, which are fundamental strategic lines and actions that are considered within the ELFAMF.

Action Plan for the Latin American strategy for strengthening fire management education

Strategic line: Approval of the strategy.

Objective: Approval, socialization and implementation of the "Latin American Strategy for Strengthening Fire Management Education"

Component: Development and approval.

Action	Activity	Indicator	Goal	Agency responsible	Resources	Year						
						2017	2018	2019	2020	2021	2022	2023
Implement the Latin American Strategy for Strengthening Fire Management Education (ELFAMF)	USFS IP consent for the development of the ELFAMF.	Adherence to USFS IP activities	Proposal document per country	National institution and CIDMF	NA	X						
	Digital and printed reproduction of the ELFAMF.	Publications	Document per country	National institution and CIDMF	NA	X						
	Carrying out the socialization of the ELFAMF.	Events	Two events per country.	National institution and CIDMF	NA	X						
	Preparation of an annual operating plan by each educational institution.	Plans	Plan per institution per country.	National institution and CIDMF	NA	X	X	X	X	X	X	X
	Formalization of annual operating plans.	Approval	Response document per country.	National institution and CIDMF	NA	X	X	X	X	X	X	X

Figure1- Strategic line: approval of the strategy. Approval, socialization and implementation of the ELFAMF

Strategic line: Teacher-training.

Objective: Strengthen the institutional teaching staff that imparts the subjects related to wildfires and fire management.

Component: Development and strengthening.

Action	Activity	Indicator	Goal	Agency responsible	Resources	Year						
						2017	2018	2019	2020	2021	2022	2023
Strengthen the institutional teaching staff that imparts the wildfire and fire management subjects, including them in training programs that are carried out in the tiered training and experience-grading scheme used by other countries.	Request the assignment of places with the person responsible for fire management training in each country.	Acceptance of participation in USFS IP courses	Proposal document per country	Educational institution per country and CIDMF	NA	X						
	Approve fire management courses at basic, intermediate and advanced levels.	Attendance and passing of courses	Course passed	Teacher per educational institution and CIDMF	NA	X						
	Coordinate with the agency responsible for attending wildfires and participate.	Events attended	Two annual events per teacher per country	Teacher per educational institution and CIDMF	NA	X						
	Maintain good health and the required physical fitness.	Certificate and test	Annual test	Teacher per institution and CIDMF	NA	X	X	X	X	X	X	X

Figure2 – Strategic line: teacher-training. Strengthen the institutional teaching staff that imparts subjects related to wildfires and fire management.

Strategic line: Curriculum development and didactic materials.

Objective:

Include, as part of curricular development of forest engineering and related science degree programs, compulsory fire ecology and effects and fire management subjects.

Develop didactic materials, including teacher’s, student and field practices manuals, and lectures on fire ecology and effects and fire management subjects

Component: Development, approval and teaching materials.

Action	Activity	Indicator	Goal	Agency responsible	Resources	Year						
						2017	2018	2019	2020	2021	2022	2023
Justify and request that the academic affairs office or the vice-president’s office of each educational institution in each country include, as part of the curriculum, compulsory fire ecology and effects and fire management subjects.	Justify and approve the analytical programs of both subjects in the curriculum of the forestry engineering and related careers	Approval of subjects	2 compulsory subjects	Each higher institution per country	NA	X	X	X	X	X	X	X
Develop and reproduce didactic materials for the Fire Ecology and Effects and Fire Management subjects.	Design teacher’s student and field practices manuals, as well as presentations.	Manuals	3 manuals per subject	Each higher institution per country	NA	X	X	X	X	X	X	X

Figure 3 – Strategic line: curriculum development and didactic materials. Include, as part of curriculum development, fire ecology and effects and fire management as compulsory subjects, and develop didactic materials.

Strategic line: Establishment of "pilot" units and holding of forums - workshops.

Objective:

Institute the establishment of permanent "pilot" research units with different management objectives, in ecology and evaluation of fire effects. Formalize the holding of national and international forums and workshops to provide updates and report progress.

Component: Management of "pilot" units, forums and workshops.

Action	Activity	Indicator	Goal	Activity responsible	Resources	Year						
						2017	2018	2019	2020	2021	2022	2023
Establish permanent "pilot" research units with different Fire Ecology and Effects and Fire Management objectives.	Arrange with land owners or holders permission for establishing "pilot" units.	"Pilot" unit	3 pilot units per institution	National institution and CIDMF	NA	X	X	X	X	X	X	X
Develop national and international forums and workshops for providing ELFAMF updates and reporting progress.	Design teacher's student and field practices manuals, as well as presentations.	Forums and workshops	1 forum and 3 workshops per country	National institution and CIDMF	National institution and USFS IP	X	X	X	X	X	X	X

Figure 4 – Strategic line: Establishment of "pilot" units and holding of forums. Establishment of permanent "pilot" research units and holding of national and international forums and workshops.

Strategic line: Agreements and evaluation of ELFAMF.

Objective:

Arrange for the signing of joint collaboration agreements between universities and national and international vocational training centers.
Carry out evaluation of progress and fulfillment of strategy objectives to fulfill the proposed mission and vision.

Component: Arrangement of agreements and evaluation of the ELFAMF

Action	Activity	Indicator	Goal	Agency responsible	Resources	Year						
						2017	2018	2019	2020	2021	2022	2023
Signing of joint collaboration agreements between national and international higher education institutions.	Conclude the signing and development of collaboration agreements.	Agreements	2 national and international agreements per institution	Each higher institution per country	NA	X	X	X	X	X	X	X
Hold events to evaluate progress, results and fulfilment of ELFAMF objectives.	Arrange for the holding of ELFAMF evaluation and compliance events.	Evaluation event	1 annual event per country	National institution and CIDMF	National institution and USFS IP	X	X	X	X	X	X	X

Figure 5 – Strategic line: Agreements and evaluation of the ELFAMF. Signing agreements between universities and assessment of progress and compliance.

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