

Community participation in integrated forest fire management: experiences from Africa, Asia and Europe

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Abstract

The consequences of increasing application of fire in land-use practices and land-use change and the subsequent outbreaks of large wildfires in the tropics and neighbouring regions during the 1980s and 1990s have led to the development of several fire management programmes in Asia and Africa. The “Integrated Forest Fire Management” (IFFM) projects are based on the assumption that communities can successfully incorporate fire usage into sustainable land use and vegetation management systems. The IFFM concept was first applied in Indonesia and Namibia. Other countries such as Mongolia, Ethiopia and Guatemala are also interested in building IFFM capacities. The Fire Ecology Research Group/Global Fire Monitoring Center (GFMC) has supported the design of IFFM projects, especially using the concept of Round Tables on Fire Management for defining the participatory approach in fire management. The GFMC in association with the UN International Strategy for Disaster Reduction (ISDR) is promoting community participation as a measure for prevention of fire disasters.

1. Introduction

The majority of wildfires in developing countries of the tropics and subtropics, and in temperate-boreal countries in transition, are caused by human activities usually associated with land-use practices and changes. Many land-use systems in these regions are vulnerable to wildfires. The property, health and welfare of people in these areas are negatively affected by direct and indirect consequences of fire and air pollution. Active involvement of the local people has therefore been recognised as a condition for the successful implementation of fire management programmes, especially at the interfaces between wildlands, managed systems and residential areas.

During the 1980s and 1990s, several technical co-operation projects were implemented in developing countries, funded bilaterally or supported by international organizations (e.g. the Food and Agriculture Organization of the United Nations (FAO) and the World Bank). Many projects were implemented in partnership with national institutions responsible for the prevention and control of forest fires, often designated as “Forest Fire Control” or “Forest Fire Prevention and Control” projects, with a purely technical approach to reduce fire hazard and improve fire suppression capabilities. This resulted predominantly in working with and through government agencies. Local people, who use fire in land-use systems and/or are major agents of wildfires, and who are also directly and adversely affected by wildfires, were not involved in project activities. There was little or no recognition of local people as important actors and stakeholders.

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The underlying concept of Integrated Forest Fire Management (IFFM), also referred to as Community-based Forest Fire Management (CBFFM), is to better integrate fire and people into land-use and vegetation management systems. The approach is based on the following considerations:

- ◆ Reasons: fire is a spatially and temporally disperse phenomenon. It is difficult to have a centralised control system, particularly in developing countries. Responsibility for fire management must be brought closer to those who benefit both from the use of fire and from having more control.
- ◆ Objectives: rational, ecologically compatible, sustainable and safe use of fire is very important. With few exceptions, complete disuse of fire is undesirable.
- ◆ Impediments: defining responsibility (or “the community”), the need for complementary policy and legislative changes, identifying and supplying technical and other support needed to enable communities assume a central role in fire management are some of the difficulties encountered.
- ◆ Entry points: possibilities include definition of mechanisms, methods and policy instruments (e.g. incentives) to encourage communities to assume control and “ownership” over fire management.

Definition and design of IFFM approaches clearly depend on the complex configuration of local cultural, social, economic, political and environmental conditions. However, a dialogue and negotiation process among all stakeholders, from local to national levels, must first be established. IFFM objectives can be successfully realized only if all stakeholders involved in fire management agree on a distribution of responsibilities, decision-making power and resources. The process of negotiation and consensus building requires careful consideration of different perspectives and also the pluriformity of the legal context. Existing rules are often of different and sometimes contradictory origins (e.g. laws and administration rules governed by centralised legislation, traditional rules that may not be legally recognised, or weakening influence of traditional structures due to increasing cultural intermix (migration) or other impacts of globalisation).

To overcome possible conflicts and deadlocks, a combination of bottom-up and top-down approaches in defining the appropriate integrated fire management strategy seems to be most effective to build consensus among stakeholder groups at different levels. In the past decade the Fire Ecology Research Group² and the Global Fire Monitoring Center (GFMC) have chosen both approaches to support the development of national IFFM programmes. Several “National Round Tables on Fire Management” were held in co-operation with the German Agency for Technical Co-operation (GTZ) and international partners, including:

- ◆ In the aftermath of the extended fire and haze episodes of the 1980s, the first national long-term strategic fire management plan was prepared in Indonesia at the International Workshop on Long-term Integrated Forest Fire Management in Indonesia (Bappenas, 1992; Goldammer, 1993). This first national round table involved most stakeholders in fire management and the international donor community. It resulted in a concerted approach in building fire management capabilities in the country, leading to the IFFM project by the GTZ in co-operation with the Fire Ecology Research Group, the largest-ever international co-operative fire management project.³
- ◆ In 1999, the Namibia-Finland Forestry Program (NFFP) also convened a national round table on fire management, which recommended a multi-stakeholder approach in fire management with particular emphasis on the involvement of regional stakeholders and local communities. The IFFM approach of NFFP, its successes and limitations, as well as the results of the round table are discussed further in this paper.

² Based at the Max Planck Institute for Chemistry, c/o Freiburg University, Germany.

³ For the community component of project, see Abberger *et al.* in this publication.

- ◆ After the large forest fires in Ethiopia in 2000 and the successful international response to the emergency (Goldammer, 2000), the government called for a National Round Table on Fire Management in September 2000. It was recognised that Ethiopia, currently a country without any fire management capacities, would build its future programme on the basis of community involvement (Ministry of Agriculture, 2001).

In other countries no formal national round tables have been held prior to launching an IFFM programme. However, in these cases in-depth investigations at the community level were conducted to define the role of community participation in fire management, for example:

- ◆ In Mongolia, a survey was conducted to investigate the underlying causes of increased occurrence of wildfires in the steppe and forest ecosystems.
- ◆ In Guatemala, a local IFFM forum was convened in 2001 to address community involvement in the lowland rainforests of Petén. Experience gained in the Guatemala forum and in the four pilot communities is to be discussed at the national level in 2002.

2. Fire management in Africa

The organizational arrangements and procedures of national and local fire management systems vary from country to country. In the following sections examples are given from Namibia, Zambia, Côte d'Ivoire and South Africa. General recommendations for fire management in Africa are also available from various publications (FAO, 1999; Goldammer and de Ronde, 2001).

2.1. Namibia

In 1996, the Forestry Department of the Ministry of Environment and Tourism selected East Caprivi Region (north-eastern Namibia) as the pilot area for the NFFP to develop a model for community-based forest fire control (Jurvélius, 1999; Kamminga, 2001). The pilot area consists of 1.2 million ha of Namibia's best forest resources and belongs to the sub-tropical region. Most of the area is communal land, but a significant part is state forest, national park and wildlife conservation area. Although the pilot area falls within the Kalahari sand zone, the forests are moderately productive because of the relatively high rainfall (700 mm). Prior to the beginning of the project, 70-80 percent of woodlands in the pilot region used to burn each year and almost all fires were anthropogenic in nature.

NFFP was launched on basis of the 1996 Namibia Forestry Strategic Plan. The first phase was implemented from 1997 to 2001. The fire component, "Pilot Project for Forest Fire Control", was modified to IFFM in 1998 to emphasise that fire is a suitable land management tool, if carefully timed and used (Goldammer, 2001).

One objective of the IFFM was to assist the government in formulating a national fire policy and regional fire management plan for East Caprivi. The main objective according to the project document, however, was "the implementation of an applicable model for integrated forest fire management, implemented by Namibians". The major outputs included:

- ◆ Improved efficiency and effectiveness of the Directorate of Forestry (DoF) and other agencies and stakeholders implementing applicable IFFM activities in the field.
- ◆ Development of national guidelines and forest fire policy.
- ◆ Changed attitudes and behaviour of general public towards the use of fire and burning, and its detrimental effects to the environment in Caprivi.

IFFM adopted the following strategies:

- ◆ Support for public relations and extension activities for forest fire prevention within the government.
- ◆ At the community level, training and mobilisation of community members towards improved fire control and subsidised cutline construction and maintenance.

- ◆ Organization of a massive fire awareness and public education campaign through schools and local organizations in the area, involving all stakeholders. This included the production and use of written materials, posters, billboards, drama, radio programmes and videos (Figure 1).

An interim evaluation in 1998 concluded that the results of creating a model for controlling fires in communal lands in Caprivi were encouraging (Table 1).

Table 1: Performance indicators of activities in East Caprivi between 1995 and 1998*

Output areas	Conventional government-run forest fire control	Implementation of IFFM		
	1995	1996	1997	1998
Total area burned (ha)	838,000	790,000	558,000	390,000
Area burned (%)	99	91	67	47
Reduction in burned area (%)	0.2	6.0	24.0	54.0
Area under forest fire management (ha)	10,000	115,000	396,000	636,000
Area covered by fire management (%)	2	14	48	76
Area protected from fire by DoF (ha)	2,000	-	-	-
Area protected from fire by local communities (ha)	0	50,000	202,000	450,000
Effectiveness of fire prevention in managed areas (%)	20	44	51	71
Number of communities/ stakeholders	0	7 + 2 DBC** + 13	23 + 6 DBC + 42	28 + 2 DBC + 24 + 64***
Fire lines or fuel breaks built (cutline) (km)	150	487	1,217	1,812
Number of people involved in fire control activities	30	300	525	1,000
Number of fires observed	>10,000	6,000-8,000	4,000-6,000	3,000-4,000
Number of people trained in forest fire control	0	7,500	13,000	33,500
Total area burned in Namibia including prescribed burning in national parks (ha)	3-5 million	3-5 million	2.1 million	2.0 million (estimate)

* The programme began only in April 1996.

** DBC = Development Brigade Corporation

*** Number of stakeholders involved in assisting the DoF in forest fire prevention activities during 1998 were: 28 local communities (16 contracted), 2 DBC camps with ex-combatants of the independence movement, 24 handicraft producer villages (under the Caprivi Arts and Cultural Association (CACA) and 64 schools

The programme has involved many local people, their participation varying from attending drama shows, learning how to fight fires, determining the locations of cutlines, to being employees constructing or maintaining cutlines. These efforts saw a 54 percent reduction of burned areas annually in the area and also a decrease of fire incidences by 70 percent.

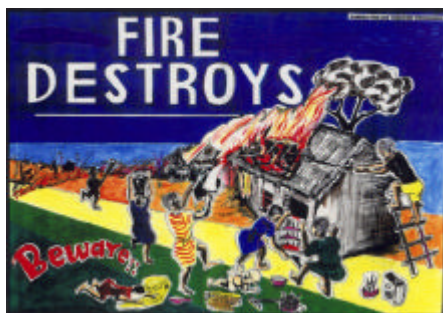
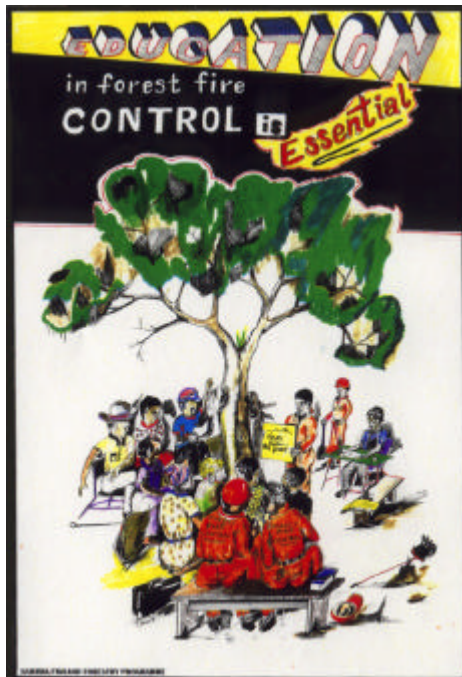


Figure 1: Examples of fire prevention posters in Namibia

During the high-risk fire season (April–November) in 1999, about 1,500 villagers were engaged in controlling wildfires in northeastern Namibia. In addition, some 1,000 teachers and 30,000 students received basic fire education.

In 1998, a survey examining local people's experiences in controlling fires in their communities showed that the positive effects of better fire control on the natural resource base were widely recognised (Virtanen, 1998), as can be affirmed by:

- ◆ improved condition of plants and trees;
- ◆ more forest products (e.g. fruits, nuts) as food supplements;
- ◆ increased numbers of wildlife;
- ◆ increased availability of grasses, thatch and other building materials;
- ◆ more fodder for livestock;
- ◆ less diseases among livestock;
- ◆ absence of livestock or crops destroyed by fire in the pilot villages; and
- ◆ increased income from sales of grasses, animals, and other products.

The survey also concluded that the government should transfer the responsibility and authority for fire protection to local people. The Namibian administration has forbidden the use of fire and this is still the situation today. The new Draft Forest Bill, however, delegates fire management responsibilities and authority to the traditional authorities. This will hopefully empower the local communities to assume ownership over fire control and management, a crucial factor for the sustainability of IFFM activities.

A recent assessment of the IFFM programme in terms of its impact on rural livelihoods in East Caprivi showed that the negative effects or "costs" of wildfires and the benefits of improved fire control on local people's livelihoods are difficult to quantify (Kamminga, 2001). Costs and benefits vary among different segments of the population and are also site specific. They depend on the general natural resource situation (e.g. alternative resources when certain areas are burned), local access rules (tenure), intensity of the land-use system, and other options available to individual households.

This complex relationship between the costs and benefits of IFFM activities is one reason why mobilising local volunteers to maintain cutlines has proven to be difficult, especially when areas are utilised for collective grazing. Land tenure is a crucial factor for community participation in fire management activities. In addition, the selected fire control techniques must be appropriate for the specific land-use system. The woodlands of East Caprivi are used for grazing. Labour intensive techniques such as firebreaks are not economically justified from the farmers' perspective and subsidies will always be necessary (Kamminga, 2001). Some lessons learned from implementing the IFFM model are:

- ◆ IFFM's concept of community participation differs from that of the local people. For example, IFFM relies on the community to volunteer partially for the cutline work. The pay is relatively low in comparison to the food-for-work system. However, the cutline workers expect commercial wages. This discrepancy endangers future social and economic sustainability of the firebreaks. A clear understanding and agreement about the work and payment among all parties must be clarified right from the beginning.
- ◆ Providing employment in an isolated and remote area saddled with political instability, considerable unemployment, and one of the highest HIV/AIDS infection rates in the country is very effective in alleviating poverty. This should be considered an objective in itself. Proper wages should be paid.
- ◆ Pressure on local IFFM staff to provide employment is high. Nevertheless, cutlines should only be constructed in communities with high risks of wildfires. Resources should therefore be allocated according to priorities based on objective, verifiable and transparent criteria. Strict supervision is necessary.

- ◆ Recruitment of labourers should favour the poorest categories of people, in particular female heads of households and married males, to help meet the basic needs of their families. Women should be allowed to work on cutlines closest to the village, while men can work further away in the bush.
- ◆ Recruitment of young male school leavers for subsidised cutline work can help to occupy the otherwise idle boys and also provide them with work experience, discipline, technical skills, etc. Emphasis must be on recruiting youngsters from the poorest households.
- ◆ To reduce competition with other household labour demands, cutline work should not coincide with the agricultural season.
- ◆ More frequent and timely payment of cutline work is crucial for optimising benefits to the target groups. Poor women, in particular, need immediate, or at least regular, income (Kammainga, 2001).

2.1.1. National Guidelines on Forest Fire Management in Namibia

After an earlier proposal to call a National Round Table on Fire Management (Goldammer, 1998) and in accordance with the recommendations of the Round Table in 1999 (Goldammer, 2001), the IFFM assisted the government to prepare the *National Guidelines on Forest Fire Management in Namibia* (Jurvélius, 2001). The guidelines strongly encouraged community participation in forest fire protection programmes.

2.2. Zambia

Widespread and uncontrolled burning is common during the dry season in the Western Province of Zambia, destroying large areas of rangelands, woodlands and forests. Some fires are started deliberately by livestock owners seeking to promote a green flush for their animals, by rodent hunters clearing vegetation to catch their prey more easily, by people creating firebreaks around their homesteads or seeking to improve visibility, or by individuals playing with fire. The fires are also ignited by people clearing land for cultivation, smoking out beehives, making charcoal, cooking or trying to keep warm. The uncontrolled fires can spread accidentally from their sources into the surrounding bush where they usually burn themselves out some distance away, often crossing into a different vegetation type (Frost, 1992a).

Whereas the lowlands seem to be able to sustain regular burning, many of the woodlands are beginning to show signs of damage from too frequent and intense fires. This is exacerbated by timber extraction, which is opening up the woodland canopy and allowing more light to reach the herbaceous layer, thereby promoting increased production of grass and fire-resistant shrubs that fuel the fires. Fires kill the more fire-sensitive trees and suppress the regrowth of the more resistant species. This is preventing the re-establishment of the woodland canopy, which would suppress herbaceous production and reduce fuel loads, fire frequency and intensity (Gambiza *et al.*, 2000).

Besides being illegal, the widespread and uncontrolled use of fire poses a number of potential problems for resource managers. For example, shortages of fodder for livestock towards the end of the dry season may more than offset any benefits derived from having access to smaller amounts of higher quality forage. Progressive declines in woodland cover and productivity, destruction of timber, fuelwood, thatching grass and other resources on which many people of the Western Province depend are other issues to be considered (Jeanes and Baars, 1991; Frost, 1992b).

Researchers and agricultural extension workers seeking to enhance cattle production in the Western Province recognised the benefits of burning to produce a green flush of grass for cattle. They also acknowledged that frequent and extensive burning was reducing the amount of forage for cattle in the late dry season. Consequently, the Rangeland Management Team (RMT) of the Livestock Development Programme, a joint Dutch-Zambian initiative, commissioned a review of the existing information and insights on savannah burning, to provide a framework for the development and implementation of a revised policy on burning, if one was needed. The review considered the following aspects (Frost, 1992b):

- ◆ fire regimes of the Western Province;
- ◆ ecological aspects of fire in southern African savannah ecosystems, including beneficial and adverse effects;
- ◆ fire behaviour and the factors affecting the behaviour;
- ◆ the use of fire in rangeland and woodland management;
- ◆ legal provisions for burning; and
- ◆ a synthesis outlining the framework for an enhanced fire policy in the Western Province.

The review was followed by a draft policy for fire management (Frost, 1992a), which was subsequently adopted and implemented at the provincial level.

2.2.1. Fire management policy

A proposed policy of planned and controlled burning of selected rangelands in the Western Province sought to trade-off the need for an adequate supply of suitable fodder throughout the dry season and the needs of other users to derive benefits from the natural resources (Frost, 1992a). The policy also implicitly recognised that the current use of fire followed traditional practices, and that it would be impossible to ban its use completely, as shown by the failure of the policy at that time. The revised policy therefore aims to maximise the benefits and minimise the drawbacks associated with the use of fire.

People generally use fire as a tool to manage natural resources. To satisfy divergent needs, conflicting objectives have to be considered (e.g. burning may improve fodder quality but is also likely to diminish the availability of thatch grass and timber). Any attempt to institute controlled burning within a community needs to be broad-based and address the reasons why people use fire, the benefits to be gained through its use and the consequences of changing the pattern of use. In short, a strategy for prescribed burning had to be developed within a broader land-use and resource-management programme.

Prescribed burning requires decisions on where, when and how to burn, what preparations are needed to control the fire, and co-ordinated actions to control the spread of the fire. Co-operative management of the post-fire regrowth is equally important. Burning for the production of high quality fodder should be confined to vegetation types, mostly the lowland moist grasslands, where sustained dry season regrowth of the grasses could be expected, even when grazed. In contrast, late dry season fires in the upland woodlands should be avoided by planning burns early in the dry season when they do not conflict with the interests of other forest users (Frost, 1992a).

To ensure success of controlled burning, community members must be party to decisions on the need for burning and its control. They must be responsible for determining which areas can be burned, when, how, and by whom. They must also be able to delegate these responsibilities. The essential role of technical assistance is to facilitate decision-making by the community, not to dictate the decisions.

An implementation strategy was therefore proposed to involve the community in the planning and implementation, and to integrate controlled burning into an overall land-use and resource management programme. The strategy addresses the following questions:

- ◆ What level of control is required to achieve the expected benefits and to restrict potential detrimental effects of burning?
- ◆ Who should be responsible for exercising control?
- ◆ How can responsibility be instituted?
- ◆ How much and what kind of technical advice is required to support controlled burning?
- ◆ What is the most appropriate framework for promoting the implementation strategy?

The RMT initiated a series of district-level workshops between December 1993 and June 1994 to promote the revised policy and to recommend an action plan. Workshops were held in five of the six districts of the province (Sesheke, Senanga, Kaoma, Lukulu and Kalabo).⁴

Although the workshops were initiated by the RMT, the meetings were officially held under the auspices of the local district council and chaired by the council chairman. Workshop participants included district councillors, members and representatives of the Barotse Royal Establishment, farmers, local officials of government departments, and other interested parties.

There was general agreement at the workshops that current burning practices were not beneficial because vegetation was destroyed, resulting in the loss of natural resources and exposed soil that is prone to erosion. These negative effects were blamed on uncontrolled and uncoordinated burning, coupled with the fire users' lack of technical knowledge.

All the workshops strongly recommended greater community involvement through their traditional leaders, together with government officials such as Natural Resources and Forestry Officers, in decisions on the use and control of fire. Responsibility for controlling burning used to be vested in traditional leaders (e.g. chiefs, indunas, and headmen). Violators of the local laws were prosecuted in traditional courts. Current legislation makes no direct provision for community control. Other suggestions on improving current burning practices included educating villagers on the responsible use of fire, introducing financial incentives and improving fire control.

Resource management entails considerable costs that may become onerous for poor rural people. In general, they only invest in natural resource management if they expect a clear improvement in their livelihoods or if it will reverse a situation that threatens their livelihoods. Experience elsewhere in southern Africa suggests that for community-based natural resource management institutions to be both functional and robust, they need to fulfil most of the following criteria (Murphree, 1991):

- ◆ Those who manage the resources must have a vested interest in the outcome. This means that the resource managers must be the landholders and primary beneficiaries.
- ◆ There must be a close and proportional link between management inputs and benefits.
- ◆ The benefits must be tangible and immediate.
- ◆ There should be local autonomy in decision-making, both in regard to management and the distribution of benefits.
- ◆ The resource user group should be small enough to be cohesive and to lower transaction costs, but not so small that it becomes exclusive and wholly self-serving.
- ◆ The leadership must be accountable, transparent and broadly representative of the community it serves.
- ◆ Responsibility at different scales should be nested to give effect to the principle of subsidiarity.
- ◆ The boundaries of the management units should be distinct and exclusive (although this requirement may be difficult to implement because there is often considerable overlap between adjacent communities in the areas from which they obtain common-pool resources).
- ◆ Political and administrative boundaries of these management units should coincide broadly with the biophysical ones.

2.3. Côte d'Ivoire

After the El Niño of 1982/83 and the extended wildfires of 1983, forest and bush fire control became an important priority of the environmental protection policy of the government of Côte d'Ivoire (Anon, 1996). In 1986, a National Committee of Forest Protection and Bush Fire Control

⁴ The Mongu District Council declined hosting a workshop, and it would be necessary to identify and address the source of its reservations.

was formed. Personnel of the Forest Service filled the positions of the General Secretariat and the Presidency of the National Committee. These bodies co-ordinated the participation of 14 ministries involved in national programmes. The task of the committee was to raise the awareness of the damage caused by fires, the need for fire prevention and techniques for extinguishing fires. In total, 1,500 village committees, 57 local committees and 32 regional committees were created to decentralise the task of fire control during the last ten years. These committees, consisting of elected members, a secretary and a president, raised consciousness of fire threats and informed the public about fire prevention. The office of the Secretary General and the regional divisions provided advice and monitored the forest fire situation at the national level. The committees receive monthly payments during the four months of the dry season. The remuneration is inversely proportional to the size of the area affected by fire as shown below (Oura, 1999):

- ◆ F CFA 500,000 (US\$1,000) per month per committee for 0 ha burned;
- ◆ F CFA 400,000 (US\$800) per month for less than 5 ha burned;
- ◆ F CFA 200,000 (US\$500) per month for less than 10 ha burned; and
- ◆ F CFA 50,000 (US\$100) per month for less than 20 ha burned.

The average annual cost of surveillance is about F CFA 3,000 (US\$7) per ha per year for forest plantations and F CFA 1,000 (US\$2) per ha for natural vegetation.

2.4. South Africa: Ukuvuka: Operation Firestop Campaign

Crisis can lead to dramatic reactions, encouraging people to co-operate in new and creative ways. As shocked residents of the Western Cape Province, South Africa, watched their mountains burn in January 2000, the thought in every mind was that something urgent had to be done to prevent such devastation from occurring again (Figure 2). Their response was speedy, dynamic and powerful. People shared a vision of maximum fire protection and restored ecological integrity, giving their time willingly to translate this vision into a business plan that would find resources and co-ordinate how various authorities would act (Kruger, 2001). The aptly named “Ukuvuka: Operation Firestop Campaign” (*Ukuvuka* is a Xhosa word meaning “to wake up”) brings together representatives of government, private enterprise and the media in a partnership unprecedented in South Africa.



Figure 2: A community in South Africa damaged by spreading wildland fire

Public sector members of the initiative include Working for Water Programme representing the national government, the Western Cape Government, South Africa (SA) National Parks, the South Peninsula Municipality, the City of Cape Town and the Cape Metropolitan Council that has committed Rand (R) 30 million to the Campaign. Other public sector organizations are contributing staff support and expertise.

Major private sector funds have come from Santam (with R20 million, believed to be the largest single donation ever made to a South African environmental project), Cape Argus (R5.5 million), Nedbank (R5 million) and Total (R4 million). In addition, local companies and the World Wide Fund for Nature (WWF) South Africa have offered free services, ranging from the production of advertising materials to legal assistance.

The Campaign's activities are governed by a Board, managed by a steering committee and overseen by independent trustees of the Ukuvuka Trust Fund. The Campaign does not carry out ecological restoration work itself but co-ordinates and funds projects under the control of SA National Parks or the local authority, the City of Cape Town.

The Campaign aims to significantly reduce the risk of damage and danger from wildfires in the Cape Peninsula. The first key objectives are to:

- ◆ control invasive alien plants; and
- ◆ rehabilitate fire-damaged areas.

Secondary key objectives are to:

- ◆ create employment, training and poverty relief for disadvantaged people;
- ◆ protect the most vulnerable communities from fire; and
- ◆ promote co-operation and social cohesion among communities.

Thirdly, institutions will be assisted to:

- ◆ implement integrated fire management plans; and
- ◆ manage the urban edge.

The Campaign has a four-year mandate, started in February 2000, to achieve its goals. It places great emphasis on an effective communication and education programme, and an accountable administration. The Campaign hopes to be a role model for similar projects elsewhere in the country by passing on lessons learned.

2.4.1. Working with the land and its plants

Since early 2000, the focus is on clearing alien plants and rehabilitating public land. After the fires, emergency measures to stabilise burned slopes are top priorities. The spectre of post-fire flooding and mudslides is a major concern after similar events in Glencairn and Fish Hoek the previous year. The City of Cape Town identified 34 high-risk sites, and by the end of June 2000 numerous anti-erosion structures, including silt curtains, sandbags and stone gabions, had been constructed.

Helped by a below average rainfall, this operation was a resounding success. Now, the Campaign is developing community-based nurseries to produce indigenous species.

The long term, and more substantial, problem is the presence of invasive alien vegetation. To date, some 750 tree and 8,000 other plant species have been imported to South Africa for use as crops, timber, firewood, barriers, or for ornamental purposes. Most cause no harm, but 198 species have been declared weeds and invasive species. Uncontrolled, these aggressive plants tend to reproduce rapidly and consume billions of litres of water each year. Urbanisation, agriculture and forestry have already occupied almost one third of the 90,000 km² Cape Floral Kingdom, and what remains (mostly in mountainous areas) is threatened by invasive alien plants. Indeed, these plants are the single greatest threat to the floral kingdom.

The City of Cape Town has a long history of destroying invasive alien plants. Currently the Cape Peninsula National Park commits more than R10 million annually on an eradication programme. Water conservation is justification enough for a war against weeds, but reducing fuel loads in the event of a fire is another important factor. The intensity of uncontrolled wildfires increases substantially when fire-prone aliens take root among the indigenous plants. The fuel load increases and densely invaded areas become impenetrable to firefighters, multiplying the risk of disaster.

Since March 2000, more than 1,000 ha of alien plants have been cleared with Campaign funds, and a firebreak is being created along the 200 km boundary of the Cape Peninsula National Park.

What this means for landowners

Existing regulations require landowners to get rid of invasive alien plants, and the laws are becoming much tougher. It is in everyone's interests to deal with these plants as quickly as possible: the longer they are ignored, the more invasive they become and the more costly to eradicate. The Campaign's extension officers are available to identify invasive trees and plants, help find suitable contractors and oversee the clearing operation.

Some stands of alien trees have special appeal because of their historical or cultural significance, or their recreational use. They will be spared, or phased out gradually. Forestry, responsible for a sizeable percentage of alien infestation, will continue in the Peninsula, but plantations will be managed accordingly. Nevertheless, some carefully controlled woodlots of alien species may be grown to provide firewood to poor communities.

It is important to remember that not all alien plants are undesirable – only those deemed to be a problem. The Campaign is trying to explain the threat to the rich indigenous vegetation and the increased fire risk to the public and private landowners.

2.4.2. Working with communities and individuals

Employment and training

One Campaign key objective is to create jobs for as many disadvantaged people as possible. Fortunately, eradicating alien invasive vegetation is very labour intensive, and cutting down trees is only the first step. The job is not complete until all the unwanted plants have been removed or burned, and careful follow-up clearing done to prevent regrowth – usually over several years. One person from each household is on contract at any one time in this activity, to ensure income to as many families as possible. Once people have acquired skills, they can gain further employment in the private sector.

Protecting the most vulnerable social groups from fire

Part of the Campaign's mission is to empower disadvantaged people to protect their families and communities. Residents of informal settlements may not be affected by a mountain blaze, but they are always at risk from fire. Their shacks are often built of highly combustible materials and are usually clustered close together. When fire strikes one of these densely populated communities, it is often impossible to contain the resulting inferno and hundreds can lose their homes.

The Campaign's target area includes five disadvantaged, fire-prone communities: Imizamo Yethu, Hout Bay fishing village, Ocean View, Masiphumelele and Red Hill. Two vulnerable satellite areas on the Cape Flats, Joe Slovo and Silver City, will also receive help. In 2000, 30 percent of reported fire incidents in informal settlements in the Cape Town municipal area and 60 percent of all dwellings destroyed occurred in Joe Slovo. Working in partnership with disaster management and community volunteers, the Campaign has distributed 4,800 buckets, whistles and informative posters in Joe Slovo. The effectiveness of a swift response to an alarm whistle to control a fire, using buckets of sand and water were also demonstrated.

In each of these vulnerable areas, training in firefighting techniques, interventions to provide fire hydrants and hardened tracks that can be used as access roads and firebreaks are underway or

being investigated. Youth groups have been established to act as information officers. Fire and access breaks between homes are still needed in some areas – a step that calls for sensitive negotiation as, inevitably, some homes will have to be relocated to create the necessary space.

Promoting co-operation between communities

The Campaign has also conducted a study to identify private properties at risk, and it is working with the local authority to advise property owners about how best to fireproof their homes. Affluent people usually have fire insurance and the means to either fight a blaze or flee by vehicles. In these cases, the Campaign encourages landowners to manage their properties responsibly, join forces to reduce the risk of fire and flooding, and contribute financially to projects in the public interest. Informal settlement dwellers, on the other hand, generally have fewer choices, no insurance and very little control over their environment. Assistance from the Campaign can help to organize them, improve their fire protection capacities and enhance their responsiveness to neighbouring communities in need.

2.4.3. Working with institutions

Fire management plans

An integrated fire management plan is vital if the various authorities are to co-ordinate and streamline their firefighting activities. The Veld and Forest Fires Act (1998) has provision for Fire Protection Associations (FPAs). The Ukuvuka: Operation Firestop Campaign is funding the appointment of a facilitator to establish an FPA in the Peninsula. Its primary tasks will be to help maintain firebreaks and to supervise volunteer firefighting groups and a rapid response system. While the FPA directs the practical operations, the Campaign's input will focus on education, firefighting training, disaster planning and the provision of equipment.

Living on the edge

People who choose to live on the mountain slopes, enjoying the beauty and advantages of the adjoining natural environment, are vulnerable to fires. They must accept responsibility for protecting their immediate surroundings. There is a need for firebreaks, erosion control and fireproofing of properties along the urban fringe. The Campaign is supporting the efforts of hack groups and nature clubs with planning, mapping, training, equipment and plants. As public awareness grows, it is hoped that landowners, apart from clearing alien plants and replacing them with indigenous species (many of which have fire-repellent properties), will participate in these efforts.

2.4.4. Communication

To help the Campaign achieve its objectives, there must be awareness, environmental education, community enthusiasm and goodwill, pressure from insurance companies and banks, and (where necessary) legal enforcement by authorities. Campaign activities are already being widely publicised in the media. School children will soon be exposed to an educational programme that will increase their knowledge about invasive alien plants and their link to fire and its consequences. Already, Campaign workers and partners sport eye-catching T-shirts, and publicity initiatives include banners, bumper stickers and advertisements to inform the public of the Ukuvuka: Operation Firestop Campaign drive.

The Campaign is a huge undertaking, but fortunately it has the enthusiastic support of various authorities, generous funding from the private sector, and a high level of co-operation and commitment from landowners. It is also a campaign that aims to facilitate a fundamental shift in the mindset of Capetonians; a shift that will ultimately be apparent throughout South Africa as the success of this ambitious project is duplicated elsewhere in the country.

Lessons have been learned, and although the Ukuvuka: Operation Firestop Campaign was born out of devastation and despair, its legacy will be immensely rich: rehabilitated and protected natural assets, and safer, more empowered communities.

3. Fire management in Asia

3.1. India

In India, Joint Forest Management (JFM) committees have been established at the village level to involve people in forest protection and conservation. At present there are 36,165 JFM committees throughout the country, covering an area of more than 10.24 million ha (Bahuguna and Singh, 2001; Kumar, 2001). The committees also have been given responsibilities to protect the forests from fires. For this purpose, the Modern Forest Fire Control plan is being revised and JFM is being made an integral component of the forest fire prevention strategy. Use of aircraft and helicopters has not been cost effective in the fire management programme and the Air Operation Wing is being closed down. For emergency purposes, however, a provision for hiring aircraft for transporting crews and water is being maintained. The Government of India has issued national forest fire prevention and control guidelines. Salient features of the guidelines include identification of vulnerable areas on maps, creation of a data bank on forest fires, establishment of a fire forecasting system, provisions for a crisis management group, involvement of JFM committees, and efficient enforcement of legal provisions.

3.2. Philippines

The Mountain Province in the Cordillera of Luzón, Philippines, is a fire-prone area. The dipterocarp stands are located along creeks and rivers mostly in the eastern part of the province, particularly in the municipality of Paracelis and Natonin. Pine forests are the major forest vegetation covering 53,767 ha, while the mossy forest covers about 37,200 ha. The pine forest with its open crown and grassy understorey provides high fuel loads during the dry season. A region-wide Forest Fire Management project, implemented from 1987 to 1989 has determined that 99 percent of forest fires are caused by human activities, such as slash-and-burn agriculture (*kaingin*), debris and garbage burning, arson, and other indiscriminate use of fire. This situation gave rise to the "No Fire Bonus Plan", which intends to involve local people in fire prevention (Pogeyed, 1998).

To motivate and encourage participation in the implementation of forest conservation/protection measures against fires, the programme's goals are to:

- ◆ organize and strengthen community members to enable them to work towards a common endeavour;
- ◆ strengthen the political will of the community and the Local Government Units towards the conservation/protection of the forest resource; and
- ◆ incorporate forest conservation/protection initiatives into development efforts at the community level.

To achieve these goals, the specific objectives are set as follows:

- ◆ limit/prevent, if not totally eradicate, the occurrence of forest wildfires in every community (barangay) of the province;
- ◆ regulate the use of fire by farmers through the issuance of permits to burn;
- ◆ monitor and record the occurrences of fire in each barangay regularly; and
- ◆ continuously investigate the causes of fires and recommend policies to concerned agencies for implementation.

Part of the implementation strategy is to mobilise all barangay communities to participate in the No Fire Bonus Plan. The provincial government of Mountain Province will establish a committee to select barangays for the plan and to facilitate the awarding of projects to winning barangays.

Participating barangays that have not incurred any forest fire during the dry season or other forest destruction, such as illegal logging and occupation in forestlands, shall be awarded development projects worth 200,000 pesos (about US\$4,000). The programme shall adopt a community-based approach in identification, planning and implementation projects. The projects

shall include, but not be limited to, environment-related activities such as garbage disposal, water impounding schemes and erosion control. A total of 124 barangays from the municipalities of Barlig, Bauko, Besao, Bontoc, Sabangan, Sadanga, Sagada and Tadian have been proposed as the beneficiaries of this programme (Pogeyed, 1998).

3.3. Mongolia

Forests and grasslands play an important role in Mongolia's economic development. Forests cover around 12.5 million ha or 8.1 percent of the Mongolia's total land area, consisting mostly of larch (*Larix sibirica*), pine (*Pinus sylvestris*), birch (*Betula platyphylla*), cedar (*Pinus sibirica*), spruce (*Picea* spp.) and saxaul (*Haloxylon ammodendron*). Grasslands cover 70 percent of the country. It is assumed that most of today's steppe vegetation is on former forest sites that have been degraded by fire. Forest fire statistics from 1963 to 1997 reveal that the majority of fires occurred within the central and eastern parts of the forested area. This can be attributed to the predominance of fire susceptible pine and larch stands. Moreover, economic activity is much higher here than in other parts of the country. Extreme fire seasons are caused by long droughts and fires are common from April to July under such conditions. The average fire season usually has two peaks: one from March to mid-June accounting for 80 percent of all fires, the other is during September and October and accounts for 5 to 8 percent of all fires. In summer, fires are rare (only 2 to 5 percent) because of heavy rains (Valendik *et al.*, 1998).

The increase in the number of wildfires since the mid-1990s corresponds to changes in social conditions. Current unemployment rates in rural areas can be as high as 80 to 90 percent. The loss of income has forced many people to resort to logging, fuelwood collection, haymaking, hunting and fishing, and, most importantly, the collection of non-timber forest products (deer antlers, pine nuts, berries, herbs and grasses). Use of natural resources for both personal consumption and sale is often seen as the only option for survival (Ing, 1999a, 1999b, 2000).

The urban population is also dependent on natural resources, dramatically increasing pressures on the environment and protected areas. Accentuating such pressures on natural areas is intensified migration as people move about looking for alternatives. The return to traditional livestock herding, as a preference to unemployment, is a major reason for rural migration. A direct result of these pressures is the increasing potential for anthropogenic wildfire occurrences through intensive natural resource utilisation and rangeland preparation. The inexperience and carelessness of urban dwellers might also inadvertently have started wildfires.

An average of 50-60 forest fires and 80-100 steppe fires occur annually in Mongolia, and about 95 percent of such fires are caused by human activities. The winters and springs from 1996 to 1998 were extremely dry and without snow in most areas. From late February to early June of these years, Mongolia witnessed large-scale forest and steppe fires that devastated large areas. Twenty-nine people died, 82 were injured and 11,700 livestock were killed. Also, 218 family houses, 1,066 communication facilities, 750 fences and 26.3 million ha of pasture and forest burned (Wingard and Erdenesaikhan, 1998; Wingard and Moody, 2000).

3.3.1. A decentralised fire management approach

Until recently, the Civil Defence, a branch of the military, was responsible for fire-related activities in Mongolia. It maintained all training, equipment and personnel with virtually no support to local communities. With the downfall of the communist regime in the 1990s and the stagnating economy, the centralised firefighting system collapsed. Perhaps the single most important contributor to the increase in fire spread was the grounding of the Aerial Patrol Service.

In 1969 the Mongolian Fire Protection and Aerial Patrol Service was established to provide early detection and rapid initial attack on fires, based on a Soviet-style aerial detection and airborne firefighting programme. The Service was staffed by 200 to 300 smokejumpers and helicopter rappellers, including a fleet of helicopters for helitack and tactical aerial support. The aerial forces operated out of seven bases distributed throughout the fire-prone regions of northern Mongolia. Smokejumpers on routine aerial patrols detected a high percentage of the fires and

handled approximately 90 percent of the suppression workload. In the early 1990s, when the communist government and Soviet financial support abruptly disappeared, the Mongolian aerial programme sharply declined. At present, the country cannot afford to maintain and fly their aerial patrol aircraft. The decline of the aerial programme through the mid-1990s resulted in a “fire suppression void” and greatly contributed to the horrendous losses experienced in the 1996 and 1997 fires.

Immediately following the 1996 fires, Mongolia received assistance from international organizations. The German government initiated an Emergency Fire Aid project in the northern and eastern parts of the country between October and December 1996. The Mongolian government has since been working to find long-term solutions to improve fire management. In a first step, the parliament passed a law designed to organize and improve firefighting efforts at all levels.

In February of 1998, the German and Mongolian governments signed an agreement to start an Integrated Fire Management (IFM) Project to be implemented over three years (1997-2000). A primary task of the project was the establishment of a fire management plan compatible with the protected area goals and the responsibilities of the local communities. Fire Management Units (FMUs) in the local communities received professional training and hand tools suitable for the regional conditions. Information and Training Centres (ITCs) provided the necessary infrastructure for fire prevention activities, management information, training, dispatch and field organization.

IFM, like other community-based programmes, focuses on flexible, pragmatic approaches designed to support local people’s role in resource management. Specifically it entails the application of modern wildland fire technologies and practices at the community level. The IFM project strengthened local capacities to effectively address fire prevention, pre-suppression and suppression by helping to organize co-operative efforts between protected area staff and local and national administrations responsible for fire management, and by including all stakeholders in the planning and implementation of fire management activities. Additional goals include establishing the necessary infrastructure, providing in-country and overseas training.

In the summer of 1998, the IFM project began pilot activities in the buffer zone communities surrounding the Khan Khentii Special Protected Area – one of the more seriously affected areas by the 1996 fires. Specifically targeted were the potential multipliers including ITC extension officers, educators, protected area rangers and key community persons. This co-operative effort resulted in the development of the following educational materials:

- ◆ a fire prevention curriculum for school children;
- ◆ fire prevention videos;
- ◆ ranger’s handbooks to be used as an outreach tool in remote areas;
- ◆ colouring books for small children; and
- ◆ a fire mascot to deliver the prevention message.

The central focus of pre-suppression work has been the drafting of a fire management plan for the protected area administration and local communities. Suppression goals include:

- ◆ establishment of fire management crews;
- ◆ provision of equipment; and
- ◆ development of a locally run “Fire Training Programme” adapted to Mongolian conditions of fuels, fire behaviour and available suppression resources and logistics.

In the spring of 1998, six soum (district) governors in the protected area buffer zone formed for each soum a 15-person FMU (or suppression crews). Each crew consists of a crew boss, assistant crew boss and thirteen volunteers. The crew is jointly managed through a Memorandum of Understanding between the local community and the protected area administration. The project also identified equipment to match the fuel conditions. Starting in March 1999, the IFM project

assisted Mongolian fire specialists in developing a series of training materials. The training programmes were adapted from existing Mongolian training schemes and the basic courses used to train American wildland firefighters. Approximately one half of the course was conducted in the field, including “practice fires” for mop-up and a live-fire exercise.

4. Germany: integrated fire and landscape management

Page and Goldammer (2000) investigated how prescribed burning by local communities can maintain the traditional open meadow vegetation structures on slopes that are threatened by secondary succession in Germany.

The history of wine cultivation in the Kaiserstuhl area, located in the Rhine valley in the State of Baden-Württemberg, dates back to the 8th Century. Farmers grew wine on terraces built on the hilly terrain. Although bushes and trees dominated the natural vegetation cover in the area, vineyard slopes have distinct meadow-like grassland. Until World War II, these ecosystems were maintained by mowing and occasional burning to retain the openness of the landscape, particularly to prevent shading of vineyards and to produce hay for cattle. After the war, wine growing became a major economic activity, while animal husbandry decreased in importance. As the farmers no longer needed hay to feed their cattle, they began to burn the slopes in the winter to suppress the growth of bush and tree species.

In 1975, following the Federal German nature conservation law, Baden-Württemberg imposed a ban of open burning (broadcast burning) of vegetation. Since then the slopes were cultivated only under certain circumstances. This led to secondary succession with an increasing invasion and expansion of bush and trees into these areas. Habitats for many plants and animal species that favour open grasslands were lost because of ecosystem changes.

The slopes in the old historical vineyards were only up to 8 m long. With the consolidation and restructuring of farmland property in the 1960s and 1970s, slopes of up to 40 m long and with over 100 percent inclination were constructed. Except for the initial establishment of grass on the slopes, no human intervention has taken place in the area. Today, both the new and the historical slopes serve to let secondary succession run its course. Given the size of the area (4 km² only in the central part of Kaiserstuhl), a major investment of time and money is required to maintain the traditional grass-dominated open structures by cutting and/or mowing, or by prescribed burning as an alternative.

4.1. Objectives of the prescribed burning project

A research project was initiated to determine whether prescribed burning of small plots in late winter could be used to maintain and promote the traditional open vegetation structure, the habitats and occurrences of typical and characteristic animal and plant species in Kaiserstuhl. A survey of the attitudes and possible involvement of the local farmers was part of the research (Page *et al.*, 2000; Weiher *et al.*, 2000).

Discussions with different groups involved in agriculture, viticulture and landscape management in the region (farmers, municipality, governmental and non-governmental nature conservation organizations) revealed conflicting views on the potential application of prescribed burning. While farmers and local municipalities unanimously supported the use of prescribed fire as a tool to suppress succession, the governmental and non-governmental nature conservation bodies were concerned about the negative impact of burning on the environment. To create a common discussion platform to address conflicting views and to develop a mutually acceptable and harmonised management strategy, a “Round Table on Slope Management in the Kaiserstuhl Area” was held.

A strategic paper, “Model for the future development of the vineyard slopes in the Kaiserstuhl area” was produced, recommending that existing open vegetation structures should be maintained by using different management practices including prescribed burning. For the first time in Central Europe, prescribed burning as a tool for landscape management was accepted as a valid practice. Details on how fire should be (re-)introduced in the future include:

- ◆ Prescribed burning will be restricted to the winter season (between November and February) under specifically defined weather conditions.
- ◆ Areas to be burned have to be small – not more than half a slope on one section of land (often, but not necessarily, under the same ownership; the absolute maximum width is 50 m on an individual slope) – and cannot be adjacent to each other. A mosaic of burned and unburned plots is a vital prerequisite for re-colonising threatened or endangered fauna, particularly arthropods.
- ◆ The owner of the slope is responsible for the management of the burns. Anyone can obtain a permit for prescribed fires, but participation in an information and training programme is mandatory.

During the winter of 2000/2001, a prescribed burning programme was implemented in one municipality (Figure 3). Based on the positive results and experience gained in community participation, the programme shall be extended to include the whole Kaiserstuhl from the winter of 2001/2002.

After a six-year test period, an efficiency control project will be carried out to validate whether prescribed burning under the responsibility of local communities can accomplish the desired goals.



Figure 3: Prescribed burning in Germany

5. Conclusions and outlook

A number of projects representing a broad range of social, economic and environmental conditions have been reviewed in this paper to introduce IFFM/CBFFM projects or approaches. In some countries, the involvement of communities in fire management is well established. In others, recent project proposals have defined approaches that are specifically designed to meet local conditions. Clearly, there are many forms and degrees of community involvement.

Despite many socio-cultural differences, it seems that the basic principles of community participation are rather similar throughout the various regions. Most importantly, however, is the question whether theoretical concepts of participatory approaches in fire management and successfully established pilot projects or "show cases" have led to sustainable improvement of livelihoods of local populations and to improved ecosystem stability and productivity.

When participation consists mainly of providing paid labour, the sustainability of such systems is fully dependent on continuous external funds. This is a problem for many countries. IFFM/CBFFM approaches that build upon existing social structures and involve traditional leadership may be less dependent on such financial support and therefore are likely to be more socially and economically sustainable. However, creating an enabling environment (e.g. appropriate changes in legislation) and awareness raising and extension support will always be required.

Despite the experiences in IFFM/CBFFM, further understanding of the concept of community participation and inter-cultural exchanges of experience and practices are necessary. The process of international co-operation in IFFM/CBFFM will hopefully help to stimulate this development.

To promote the IFFM/CBFFM approach, the GFMC jointly with the UN International Strategy for Disaster Reduction (ISDR) prepared the UN 2000 World Disaster Reduction Campaign that addressed community participation in fire management (ISDR, 2000). An international concerted programme in conjunction with IUCN/WWF Firefight and an earlier Global Environment Facility (GEF) proposal by the GFMC that will consequently follow up the concept of fire disaster reduction through community involvement is highly recommended.

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