



## NEPAL

### Participatory Forest Fire Management: An Approach

#### Abstract

Forest fire is considered as a problem in forest management system in Nepal. If natural disasters are excluded then forest fires come close to being the worst kind of all known disaster.

Fire-induced loss of soil cover negatively affects hydrological regimes and soil properties, leading to severe erosion and loss of productive topsoil. High economic losses are caused by damaging valuable timber and non-timber resources, natural regeneration, and planted forests.

Community involvement is proved to be successful for sustainable resource management. Community-based fire management could be the key to over-coming the recurring problems of forest fires in Nepal.

This paper attempts to shed some lights from the perspective of professional involved in forestry about *Where we are? Where we want to go? How can it be achieved?* – with some recommendations for the development of participatory forest fire management system in Nepal as a momentous approach for forest fire management in Nepal.

#### 1. Introduction

Forest fire is considered as a problem in forest management systems in Nepal. If natural disasters are excluded then forest fires come close to being the worst kind of all known disaster (2).

In mixed forest of sal (*Shorea robusta*) in the Terai – a flat area in southernmost east to west belt of Nepal – the fire season starts from mid-March and the fires burn the forests 1-3 times till the end of May. All fires are surface fires. About 90 percent of the forested area in the plain was burnt out one to three times every year. This condition is more or less similar in all Terai districts (6) and mountain regions as well.

Forest fires destroy timber and non-timber forest products, although no data are available about the number of fires, severity and the amount of loss. Fires also reduce the biological diversity of the forests to a great extent. In addition, fires degrade the soil, inducing flood and landslide damage. Forest fires make the entire countryside hazy, thereby reducing aesthetic values for eco-tourism during the dry season. At least one hundred villages are burned annually in Nepal, some of which are definitely destroyed by forest fires where the roofs are made of thatched grass (11).

Fire-induced loss of soil cover negatively affects hydrological regimes and soil properties, leading to severe erosion and loss of productive topsoil. High economic losses are caused by damaging valuable timber and non-timber resources, natural regeneration, and planted forests (15).

Burning for stimulation of new grass (intentional) and smokers (negligence) alone share about 45 percent of fires among all known causes of forest fires. Natural causes (e.g. thunderstorms) of fire are not reported. People set about 64 percent of fires intentionally; about 32 percent of fires are due to accidental/carelessness, and about 4 percent by unknown causes (5).

Forest fire management is not practiced in Nepal. The community forest users' groups control forest fires in their own forests, although they do not have a plan for systematic prevention and control of fires (11). Most of these community forests are located in the Middle Mountain Region where forests are severely fragmented and surrounded by villages. Here the community forest users are able to protect their respective forests from cutting and grazing. However, occasional forest fires occur due to the negligence of smoking travellers. The forest users are able to fight forest fires although they do not

have proper tools and technical support. In fact, community forests are not managed properly, nor are forest fires fought in an appropriate manner.

Despite the economical, ecological adverse impacts of the forest fire, government agencies do not give priority for fire management in terms of budgets and human resource development. Forest managers often ignore economic, ecological and cultural (values) impacts of forest fire and millions of people who have been entailed with them.

Forest development, protection and utilization efforts should go hand in hand for forest fire control measures to be effective. In government-managed forest, some steps taken by the Department of Forests even though at an indicative level are positive steps in this direction. Strengthening of this Department to cover the sustainable forest management at regional, national and local level is indispensable if its efforts are to materialize in a tangible manner.

Most poor people live near to the forest and mostly depend on their livelihood on it and reasons for the fires. So, livelihood of the poor should be addressed in the whole fire management scenario.

## **2. Objectives**

The main objectives of 'Participatory Forest Fire Management' is to prepare and implement fire management plans and to participate in general forest fire prevention and suppression programmes in the community forests and neighbouring government managed forests (e.g., fire lines and access trails, fire fighting tools and lookout towers, pre-attack planning, etc.).

### **Fire Suppression**

1. Encourage the formation of volunteer fire fighting group from the community forest users' group.
2. Provide training on fire fighting techniques and tactics to the members of fire fighting group.
3. Develop and provide fire fighting tools to the fire fighting group.

### **Fire Prevention**

1. Utilize community forest users' groups (CFUGs), local non-government organizations (NGOs), other community based organizations (CBOs), private sectors (PSs) and universities for extension, research and development activities.
2. Stimulate community cooperation in fire prevention through various incentive measures.
3. Encourage integration of agriculture and grazing land-use into fuel break systems through incentive mechanisms.

## **3. Forests and Forestry in Nepal**

Total land area of the country is 14.7 million hectares (ha). Within a horizontal distance of about 150 km there is an elevation range from 150m in south to 8848m in north. Due to the east-west orientation of the mountain ranges, the country has a tropical climate in the south and temperate and alpine climates in the north. The number of ecosystems per unit area is probably greater than in any other country in the world (1). Nepal has 39.6% forest area (forest cover, i.e. at least 10% crown cover, and shrub cover including protected areas) (7). Accordingly, there are many different vegetation types in Nepal.

### **3.1 Types of Forests**

The Master Plan for the Forestry Sector Nepal (MPFSN) of 1988 defines forest as "forested lands having at least 10% crown cover including small pockets of plantation and burned areas".

The Forest Act 1993 defines forest as "the area covered fully or partly by trees". It further defines National forest as "apart from private forest, all demarcated or non-demarcated forest within the Kingdom of Nepal and the term incorporates the bare or non-registered land near by or surrounded by the forest and foot trails, ponds, lakes, rivers and river banks too".

The Forestry Sector Policy 2000 classifies forests and protected areas for the purpose of conservation and management as indicated below:

All forests except those designated otherwise are national forests. They are divided into the following categories:

1. Government Managed Forests: National forest area managed by His Majesty's Government of Nepal using approved forest management plans.
2. Community Forests: A part of national forests which are handed over to users' groups as community forests to conserve, manage, and utilize for their basic needs.
3. Leasehold Forests: Forests on land that has been leased by central or local government agencies to private owners including individuals, co-operatives, institutions, and commercial firms.
4. Religious Forests: Forest belonging to religious institutions.
5. Private Forests: Forests or trees raised and managed on privately owned lands.
6. Protected Areas: National forest declared by the HMGN as a protected forest pursuant to the Forest Act 1993, which considers it has a special environment or scientific or cultural importance.
7. Conservation Areas: Land such as national parks, reserves, protected areas, or other categories gazetted under the National Parks and Wildlife Conservation Act 1973.
8. Protected Watersheds: Any land under public or private ownership designated as a protected watershed under the Soil and Watershed Conservation Act 1982.

Mostly based on the Master Plan for Forestry Sector Nepal 1989, Jackson (1994) has classified forests according to the species composition in his popular book the 'Manual of Afforestation in Nepal'. He found 24 vegetation types based primarily on altitude namely:

#### Tropical types

1. *Shorea robusta* forest
2. *Acacia-Dalbergia* forest
3. Other riverine forest
4. Grassland
5. *Terminalia- Anogeisus* deciduous hill forest

#### Sub-tropical types

6. *Pinus roxburghii* forest
7. *Schima-Castanopsis* forest
8. *Alnus nepalensis* forest
9. Riverine forest with *Toona* and *Albizia*

#### Lower temperate types

10. *Quercus leucotrichophora* & *Q. lanata* forest
11. *Quercus floribunda* forest
12. *Quercus lamellosa* forest
13. Mixed broadleaved with Lauraceae forest
14. *Pinus wallichiana* forest (lower type)

#### Upper temperate types

15. *Quercus semecarpifolia* forest
16. Mixed broadleaved forest
17. *Rhododendron* forest
18. Coniferous forest

#### Sub-alpine types

19. *Abies spectabilis* forest
20. *Betula utilis* forest
21. *Rhododendron* forest
22. *Juniperus indica* steppe
23. *Caragana* steppe

Alpine type

24. Alpine vegetation

### 3.2 Community Forestry

The Master Plan of Forestry Sector Nepal (1988-2008) has considered the Community Forestry as first Primary Programme. The Tenth Five Year Plan of Nepal (2002-2007) has considered it as first Priority Plan (P1). Management approach in community forestry is of passive type i.e. protection.

At present, there are more than 135,700 community forest users groups including 690 (about 25%) women users group. Forest areas handed over to them are 1,115,870 ha (1.91% of total forest area and 0.76 % of country area). Total 1,533,068 households are benefited (14).

Major forest products collected from the community forests are timber, fuelwood, grass/ fodder/ litters, khair (catechin wood), medicinal herbs, and turpentine. Data of forest product collection, uses and sell reveals that the total use value and stumping value of the forest products is about NRs. 747,342,954.00 and NRs. 1838,840,495.00 respectively (Kandel, 2004) (13).<sup>1</sup>

### 3.3 Current Forest Fire Management Practices in Nepal

Forest fire prevention activities are being carried-out in priority districts (for instance, Saptari, Siraha, Sindhuli, Sindhupalchowk, Kathmandu, Dang, Surkhet and Dadeldhura) by the Department of Forests under the National Forest Programme on an ad-hoc basis. Very few budgets have being allocated (for instance, NRs 50,000 for each district in fiscal year 2004-2005) for paying wages for fire watchers, producing and setting up signboards and posters, distributing flyers and using loudspeaker announcements during the fire season. The major criteria for prioritizing districts for the activities are forest conditions (in terms of forest stocks) and demand.

The community itself by traditional ways and means has done forest fire suppression activity in community forests. In case of big fire, they may request for help to District Forest Office or vice versa.

In plantation forests, in Sagarnath (16,000 ha) and Nepalgunj (3,680 ha) Forest Development Project areas, there were very good forest fire management systems in pre-fire management (e.g., fuel management), fire detection and fire suppression, and post-fire management (e.g., Mopping-up) during the project period. Now, a passive forest fire management system is being applied. The forests have been developed from degraded forests converted into planted forests with some exotic species like *Tectona grandis* and *Eucalyptus camaldulensis*.

Despite the enforcement of strict law by the government of Nepal to discourage forest fire incidence, it has not been implemented properly due to procedural difficulties and human behaviour.

### 3.4 Prevailing Policies and Legislations regarding Forest Fire Prevention

#### Master Plan for the Forestry Sector (MPFS) Nepal 1989

The MPFS determines the following objectives for the development of the forestry sector mainly for forest protection particularly for forest fire protection:

- Second Long-term Objective states “to protect the land against degradation by soil erosion, floods, landslides, desertification, and other effects of ecological imbalance”.
- First Medium-term Objective states “to support decentralization and promote people’s participation in forest resource development, management, and conservation”.

#### Forestry Sector Policy 2000

Soil, water, flora and fauna constitute the main elements of forestry. Together with other biotic and abiotic factors these elements help sustain biodiversity. Some of the objectives are stipulated below:

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<sup>1</sup> 1000.00 Nepal Rupees = ca. \$US 15.00

- One of the long-term objectives of the Forestry Sector Policy is “to protect land from degradation by soil erosion, floods, landslides, desertification, and other effects of ecological disturbance”.
- One of the medium-term objectives of the policy is “to promote people’s participation in land and forest resource development, management, and conservation”.
- One of the short-term objectives of the policy is “to provide increased opportunities to the people for forestry resource management under the community, private, and leasehold forestry programmes as well as the biodiversity conservation programme provided for in the new forestry legislation”.

#### **Tenth Five Years’ Plan (2002- 2007) 2002**

Forestry Sector’s Objectives of the 10<sup>th</sup> Five-Years Periodic Plan of Government of Nepal are:

- To manage, develop, conserve and wise use of forest resources, and conserve the environment fulfilling the basic needs of forest products to contribute poverty alleviation, and
- To emphasize people’s demand and participation in programme implementation.

#### **Forest Act 1993 & Forest Rules 1995**

Forestry legislation used to be formulated to resolve past problems related to protection rather than to meet present and future needs for better management and increased production. Policy is now very clearly oriented towards “people’s participation” in contrast to previous legislation. The preceding policies are being implemented under the Forest Act of 1993 and the Forest Rules of 1995. Both the ‘Act and Rules’ aim to develop forestry sector through decentralization and the participation of individuals and groups.

##### Prevention

In Clause (b), Section 49 of Forest Act 1993, "setting fire, or do anything that may cause a fire accident" in national forests is prohibited. In Clause 1(b), Section 50 of the Act, any person who commits such offence shall be punished with a fine of not more than NRs. 10,000.00 or with imprisonment for a term not exceeding one year, or both. This is the only one legal provision for fire prevention but it is still ineffective because of the human behaviour and procedural difficulty to identify the offender.

##### Rehabilitation

In Clause (c) of Sub-rule (2) of Rule 9 of the Forest Rules 1995 has provision of construction wood (quantity determined by the District Forest Product Supply Committee) to the fire-victim household for the rehabilitation purpose with royalty price.

#### **4. Fire Management Options**

Fire Management incorporates all activities required for the (protection of forest and human values from fire, and the use of fire to meet land management goals and objectives.

The basic fire management options that can be considered for application within tropical forests include(15):

**Fire Exclusion** - applicable in those forest types where any fire effect would be undesirable and unproductive to the resource management and conservation objectives (e.g., conservation areas, demonstration plots, fire intolerant plantation-type forests).

**No Fire Management Measures Taken** - applicable where occurrence of uncontrolled fire may be tolerated as long as no additional degradation factors interfere, such as excessive grazing. Also applied where no alternatives exist because of lack of active fire control capabilities.

**The Fire Exclusion and No Fire Management** approaches should only be considered where it is known that forest fuels will not build up and result in extreme wildfire behaviour and damage to human values and forest ecosystems.

**Integrated Fire Management** - applicable where there is a good understanding of the impacts of fire on the specific forest types involved; where there is capability to actively manage all fire situations (e.g. to prevent and suppress all undesirable fire); and where the use of prescribed fire will promote

resource management and other conservation goals. The application of the Integrated Fire Management option should be given primary consideration where wildfires have the potential to threaten human life or property and other assets identified in management plans for protection.

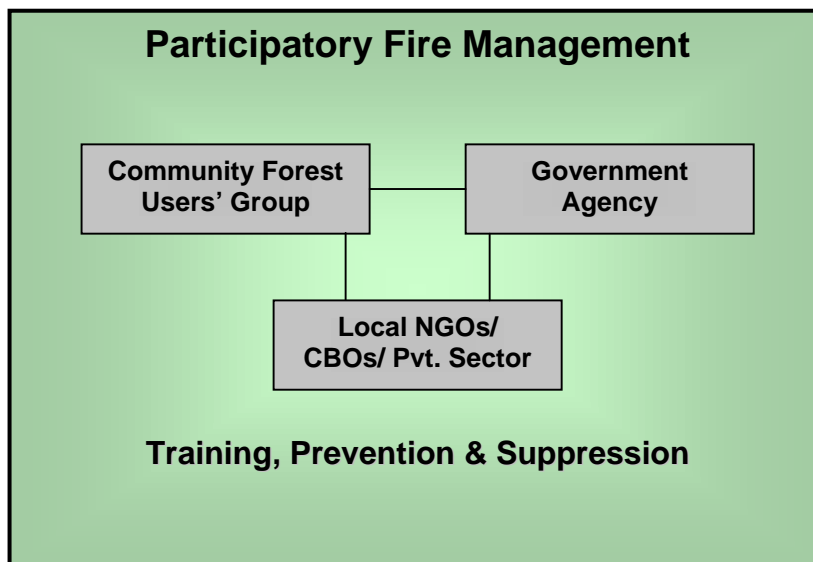
Integrated fire management measures include the following aspects:

- Fire prevention
- Fire pre-suppression
- Fire suppression
- Training and education
- Law enforcement and the use of incentives
- Prescribed burning for specific purposes

## 5. Participatory Approach to Forest Fire Management

### 5.1. General Approach to Forest Fire Management

Forest fire management should include administrative decisions and operational activities that involve prevention, preparedness, suppression, response, relief, rescue, recovery and rehabilitation involving all stakeholders concerned. Community involvement must always be part of the disaster management approach. The importance of community involvement can best be described with an example.



**Figure1.** Concept of Participatory Fire Management

**Table 1:** Involvement of stakeholders in Participatory Fire Management activities

Forest type	Focal responsibility	Other Stakeholders
Government Managed forests	DFO	CFUGs, CBOs, NGOs, local governments,
Community Forests	CFUG	DFO, CBOs, NGOs, local governments,
Leasehold Forests	Leaseholder	DFO, CFUGs, CBOs, NGOs, local governments
Religious Forests	Religious Institution	DFO, CFUGs, CBOs, NGOs, local governments
Private Forests	Private Owner	DFO, CFUGs, CBOs, NGOs, local governments
Protected Areas	DFO	CFUGs, CBOs, NGOs, local governments
Conservation Areas	Parks and Reserve Office/ DNPWC	DFO, CA Management Authority, BZFUG, CBOs, NGOs, local governments
Protected Watershed	DSCO	DFO, CFUGs, CBOs, NGOs, local governments

Note:	BZFUG	Buffer Zone Forest Users Group
	CA	Conservation Area
	CBO	Community-based Organization
	CFUG	Community Forest Users Group
	DFO	District Forest Office
	DNPWC	Department of National Parks and Wildlife Conservation
	DSCO	District Soil Conservation Office
	NGO	Non-government Organization

## 5.2 Key elements of Forest Fire Management

Some key elements of forest fire management strategies are listed below. These are not the only ways that the fire can be managed and are only meant to guide implementing institutions dealing with the fire to become better prepared for it.

### Prevention

Government agencies and other concerned stakeholders can better prevent the forest fire by conducting certain activities before a fire occurs. These can include awareness raising among people, constructing a fire line or control burning in a forest area; and ensuring that there is proper socio-economic development and active ownership and participation of communities along the forest fire management system (all the phases of the disaster management cycle).

### Preparedness

Preparedness measures such as the arrangement of fire-fighting tools and the training of fire fighting crews to extinguish fire are other essential components of forest fire managing. Furthermore, this should be an ongoing, regular function of government agencies. These measures can be described as logistical readiness to deal with fires and can be enhanced by having response mechanisms and procedures, drills, developing long-term and short-term strategies, public education and building early warning systems.

Risk assessments (identifying those areas e.g. demonstration plots, resin tapping areas, protected areas and villages that may be at risk before a fire occurs) are also essential and may complement development strategies in local areas.

Preparedness can also take the form of ensuring that strategic reserves of food, equipment, water, medicines and other essential materials are maintained in cases of catastrophes.

### Suppression

Forest fire suppression refers to measures that can be taken to minimize destructive and disruptive effects of hazards and thus lessen the scale of a possible impact.

A forest fire management plan and structure (e.g., forest fire committee at the local level) should be established. Each plan will be site or local specific and as such must be tailored for the district forest office concerned. For example, a community forest users' group in the middle mountain may prohibit grazing or unauthorized entering into resin tapping area during the fire season. A District Office in the Terai plain may hire the fire-watcher(s) to detect fire to look after a block of forest during a fire season.

Forest fire mitigation can be achieved through backfiring, fire-fighting, and escaping from the fire.

### Response and relief

If a forest fire does occur then response and relief have to take place immediately; there can be no delays. Area burned and intensity of damages will be geometric order with time. Clear plans and proper implementation of the plans have significant role to manage such events. It is therefore important to have contingency plans in place.

### Rescue, recovery and rehabilitation

Interventions are also needed after the fire occurs. Mopping-up and revegetation in the areas need to be carried out. In some cases, forest fires enter to adjacent villages and burn houses and cattle-shed causing losses of lives and properties. In many ways this is the most difficult period for the victims and the victims should be address with proper rehabilitation.

Forest fire management, as shown by these examples, requires effort and commitment by the various stakeholders. The capacity must be built to handle such events, and training programmes are essential. It is important to note that forest fires are non-routine events that require non-routine response. Governments cannot rely on normal procedures to implement appropriate responses - they will need to learn special skills, techniques and attitudes in dealing with the fire.

The key elements of forest fire management listed above are important in providing governments with the capacity to deal with forest fire management at various stages. This is not an exhaustive list of areas, simply the most important ones.

**Table 2:** Selection and Implementation of Countermeasures

Phases	Activities	Examples		Remarks
<b>Pre-fire</b>	Preparedness	Awareness raising	Preventive measures	Mitigating Measures
		Construction of fire-lines Prescribed burning Arrangement of fire-fighting tools and the training of fire fighting crews Risk assessment Insurance Maintain warehouse with essential materials		
<b>During the fire</b>	Response	Fire detection Prompt mobilization of fire crews Fire fighting Backfiring Wildland fire fighter safety	Suppression Measures	Rescue and relief
<b>Post-fire</b>	Recovery	Mopping-up Revegetation of burnt areas Shelter, food, water, medicine, counselling to the victims	Rehabilitation measures	Ensure people's participation and livelihood
				Development of Institutional structures; Planning; Policy and legislation

This is not a complete framework of countermeasures for forest fire management. Examples of activity given above are the most important ones, not an exhaustive, but can be selected or added according to local situation.



### 5.3 Fire Fighting Tools and Equipments

The list of contents of equipment sets for a 15 members VFCE is depicted in Table 3 below.

**Table 3:** Proposal of an equipment set for a Village Fire Control Group (volunteer) of 15 members (Sources: 4, 9, 12)

Type of Equipment	Number
Fire swatter	3
Fire shovel	3
Fire rake	3
Fire rake-hoe	3
Chain saw	1
Metal bucket	3
Improved bolo	3
Fire axe-hoe	3
First aid kit	2
Protective clothing	15
Helmet	15
Boots	15

### 5.4 Some Indicators for a Forest Fire Management Plan

Following are the some important points, though not exhaustive ones, that needs to be considered while preparing a forest fire management plan (8):

- Forest area, types of fuel, climate, history of fires, local demography
- Responsible organization
- Fire suppression plan
- Fire hazards reduction
- Fire hazard measurement system
- Fire detection plan
- Fire communication information system
- Cooperative organization and human resources
- Fire fighting equipments
- Work safety
- Fire hazard maps and data

## 6. Some issues related to Forest Fire Management

### Human resources

Human resources charged with forest fire management in the Ministry are scarce, and dedicated, research-minded, well-trained personnel in Nepal are generally not attracted to forest fire management activities. An incentive system has to be developed to generate interest in a forest fire management career and to encourage greater management productivity.

### Institutional development

The Forest Protection Section within the Department of Forests in the Ministry is looking after forest fire management. It should grow into an effective body for managing the forest fires and coordinating and networking covering the various organizations. International linkage and cooperation should be established.

### Developing facilities and improving research technology

Tools and equipments are not sufficiently developed and provided to field level offices and community forest users' groups. Technological constraints have not been as limiting to the development of forest fire management system as human and financial resources.

### **Financial allocation for forest fire management**

Funds have not been adequate for the forest fire management. The reason for that is why only selected districts have been covered with minimum budget only for some preventive works.

### **Research and Monitoring**

Forest fire research and monitoring efforts by experts are minimal.

## **7. Challenges**

In one hand, in the national front, developing communication system, developing fire prevention-based livelihood of local peoples, addressing traditional right of local peoples in resources utilization, involving private sector in forest fire management, motivating universities in research activities, and promoting stakeholding of community forest user groups, District Forest Office, and local NGOs/ CBOs are the prime challenges facing by the country.

On the other hand, at the international front, for comprehensive and collaborative fire risk reduction and management between and amongst Nepal's neighbours India and China need to be promoted. At the same time, international technical and financial supports need to be sought for the development of forest fire management system in the country.

## **8. Conclusions and Recommendations**

Forest fire is considered as a problem in forest management systems in Nepal. If natural disasters are excluded then forest fires come close to being the worst kind of all known disaster.

Despite the economical, ecological adverse impacts of the forest fire, government agencies do not give priority for fire management in terms of budgets and human resource development. Forest managers often ignore economic, ecological and cultural (values) impacts of forest fire and millions of people who have been entailed with them.

Forest development, protection and utilization efforts should go hand in hand for forest fire control measures to be effective. Some steps taken by the Department of Forests even though at an indicative level are positive steps in this direction. Strengthening of this Department to cover the sustainable forest management at regional, national and local level is indispensable if its efforts are to materialize in a tangible manner.

Community forest users are able to protect their respective forests from cutting and grazing. However, occasional forest fires occur due to the negligence of smoking travellers. The forest users are able to fight forest fires although they do not have proper tools and technical support. In fact, community forests are not managed properly, nor are forest fires fought in an appropriate manner. Awareness and Training programmes to community forest users' groups are significantly useful to conserve the community resources.

Community involvement is proved to be successful for sustainable resource management. Community-based fire management could be the key to overcome the recurring problems of forest fires in Nepal.

Some of the recommendations with respect to forest fire management are enlisted below:

- There needs to be a comprehensive national fire policy to reduce the social and economic costs to the community caused by forest fire. The policy should properly address problems in government-managed forests, community forests as well as other national and private forests. Principles stipulated in 'ITTO Guidelines on Fire Management in Tropical Forests' useful to policy makers and guidelines based on vegetation type need to be prepared and disseminated.
- Forest Protection Section within the Department of Forests in the Ministry should grow into an effective body for managing the forest fires and coordinating and networking covering the various organizations. International linkage and cooperation should be established.
- Human resources development at Ministry of Forests and Soil Conservation level, and Awareness and Training programs at community level should be given a prime importance.

- Forest fire seems to be neglected in overall scenario of disaster management in Nepal. It should be included in the National Program as a development work in itself.
- There is much to be done in the field of forest fire researches and studies, fire standards, economic, social, and environmental considerations. Fire hazard maps useful to forest managers and also to the local people need to be prepared and disseminated.
- Tribes and local communities have legal grazing rights in the communal pasture land that must be addressed in forest management and policy.
- There needs to be develop the 'stakeholding culture' in resource management with strengthening and motivating to all concerned stakeholders
- **'Integrated Community Forest Fire Management'** seems to be the more practical option for successful forest fire management.

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