FOREST FIRE PREVENTION
FOR EXTENSION WORKERS

SUMMARY OF TRAINING MODULE

ITTO PROJECT PD 89/90 (F) PHASE III
HUMAN RESOURCES DEVELOPMENT

DEPARTEMEN KEHUTANAN

CENTER FOR FORESTRY EDUCATION AND TRAINING
MINISTRY OF FORESTRY, REPUBLIC OF INDONESIA
INTERNATIONAL TROPICAL TIMBER ORGANIZATION
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Forest Fire Prevention for Extension Workers

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Ministry of Forestry, Republic of Indonesia
International Tropical Timber Organization (ITTO)

ITTO PROJECT PD 89/90 (F) HUMAN RESOURCES DEVELOPMENT
Training Module
Forest Fire Prevention for Extension Workers

Summary

This document is the summarized version of Forest Fire Prevention Training Module for Extension Workers. The original version is published in Indonesian as one of the results of the cooperation between the Center for Forestry Education and Training (CFET), Ministry of Forestry, Republic of Indonesia and the International Tropical Timber Organization (ITTO) through ITTO Project PD 89/90 (F).

The first chapter introduces the background, objectives, target groups, methods teaching equipments and materials, and curriculum.

The objectives of this training are: (1) To equip forestry extension workers with knowledge and skills on Forest Fire Prevention, (2) To prepare forestry extension workers to be able to plan extension activities, and (3) To improve the forestry extension workers knowledge in their knowledge on extension skills especially related to Forest Fire Prevention.

The target groups of this training are forestry extension workers. The methods used are mostly active learning and sharing experiences.

Chapter two explains theoretical subjects delivered in the training course:
(1) Introduction to the Course/Climate Setting.
(3) Basic Principle of Forest Fire.
(4) Techniques of Forest Fire Prevention.
(5) Formation and Development of Group.
(6) Extension Methods and Aids.

Chapter three covers the following subjects related to exercise or fieldwork activities:
(1) Inventory and Identification of Resources for Forest Fire Prevention.
(2) Mapping of Forest Fire sensitive Areas and Potential Resources for Forest Fire Prevention.
(3) Semi-structured interview on Traditional Wisdom in Fire Uses, Group Formation Process and Group Mobility.
(5) Development of Extension Aids.
(6) Development of Fire Warning Signs.
(7) Extension Activities.

This module needs to be further elaborated and modified to meet recent development or local specific environment.
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CHAPTER I. INTRODUCTION

1.1. Background

Forest fire in Indonesia, because of their frequency and severity during the last two decades; have emerged on the global agenda as a major problem needing urgent and continuous attention.

Most forests in Indonesia are categorized as tropical rain forests, since the country is located in the tropics where there is plentiful rainfall. This provides conditions, which are favorable for many organisms to live, all of which have contributed to making Indonesia as the mega diversity country. The majority of many elements of this biodiversity are found in the natural rain forests of Borneo (Kalimantan), Sumatra and Papua.

Large areas of land and forest in Indonesia burned in 1982 and 1983. In Kalimantan alone, the fires burned from 2.4 to 3.6 million ha of forest. Land and forest also burned in Indonesia during extended dry periods in 1987, 1991, and 1994 and most recently in 1997-1998. Various estimates of total area burned during the most recent fires range from hundreds of thousands to millions of hectares.

In the late 1997 and early 1998, devastating forest fires in several locations in Indonesia alerted the Southeast Asian region to the urgency of the need to find effective solutions to a recurring social and environmental problem with local, regional and global consequences. Human health was disturbed due to very thick haze spreading to the neighboring countries, causing in some instances to panic because it has gone the tolerable limit. Major modes of transportation were hampered—many flights were grounded, sea and river transport bore the high risk of accidents, and so were the many means of land transportation. Of no less importance was the loss of
valuable timber from the lush tropical forests, the lowering quality of animal and plant habitat and the loss of gene pool and biodiversity.

The causes of forest fires can be grouped into two categories—predisposing (creating conditions favorable for fires) and immediate (leading to ignition). Both these can be natural or man-made; and they reinforce each other. El Nino Southern Oscillation (ENSO) phenomenon is a natural predisposing factor, whereas man-made factors are: wasteful logging, forest clearance for agricultural crops, estate crops and forest plantations leading to build up of combustible materials; in adequate fire protection measures etc.

Looking to the future, ENSO will continue to occur. Also land use patterns will continue to fragment Indonesia's forested landscape, producing more and varied fuels for fire. As such, forest fire prevention should be undertaken as a joint effort of all concerned. It is widely realized that prevention is one of the most effective ways to tackle forests and land fires. If we can lessen the possibilities of fire incidents, it would reduce efforts of suppression and rehabilitation. However, forest fire is a weak area in Indonesia. Efforts to prevent forest fires call for stakeholder actions to control the causes of fire. Knowledge about, and analysis of, causes, both predisposing and immediate, of forest fires is important to design and implement measures of fire protection.

To enhance both theory and practical skill of all related parties on forest fire prevention, Center for Forestry Education and Training (CFET1)—Ministry of Forestry of the Republic of Indonesia in cooperation with the International Tropical Timber Organization

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1 CFET has the duties to carry out education and training for forestry officials within the Indonesian Ministry of Forestry and other institutions related to forestry development. In implementing its duties CFET carries out the following functions: (1) To carry out the policies of the Ministry in education and training (2) To formulate the plan, programs, evaluation and reports (3) To study and develop education and training (4) To serve, supervise and coordinate educational and training activities (5) To manage the Center’s administration.
[ITTO Project PD 89/90 (F)] have identified, developed and successfully tried-out\(^2\) of seven training modules for seven target groups; (1) extension workers (2) trainers (3) middle-managers of forest concession holders (4) middle-managers of government officials on district level (5) local community (6) forest guards and (7) non-government organizations. All those seven training modules were written in Indonesian.

In order to reach the wider readers and to enable to support similar activities in South East Asia, three [(1), (5) and (7)] of those seven training modules were summarized and translated in English.

This document is the summarized version of *Forest Fire Prevention Training Module for Community*. On the original version of the module, each module is composed of four chapters; (1) Introduction (2) Guide for Module’s User (3) Curriculum and Syllabus (4) Training Manual. Chapter One to Chapter Three acts as introductory chapters, while the core of the module lies on Chapter Four. The latter chapter gives a comprehensive guidance to the trainers/tutors/facilitators on both *Theory* (class-room session) and Fieldwork (practical exercises). The level of guidance is given on a training subject basis, which are composed of *Tutor Note* (rough session scenario) and several hand-outs for participants. As such, tutors have to prepare *Trainer’s Agenda/Session Planning* by themselves.

It must be kept in mind that this module only contains minimum set of training material, thereby further elaboration, modification are required to meet recent development or local specific environment.

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\(^2\) The main idea of training try-outs is to evaluate or test the initial draft of the newly developed module in the field. By testing the modules, it could be found several inconsistencies, irrelevant material, impractical exercises, insufficient time allocation etc. Those things will be bases to improve the modules.
1.2. Overall objectives of the training course

(1). To equip forestry extension workers with knowledge and skills on forest fire prevention.

(2). To prepare forestry extension workers to be able to plan extension activity

(3). To improve the forestry extension workers knowledge on their extension skills especially related to forest fire prevention.

1.3. Target group

Forestry extension workers.

1.4. Methods

The training module is not designed like a medicine or a cookbook; it is open for creativity of trainers/facilitators/training organizers. As such, further elaboration, modification or adaptation is required to meet recent development, level of participants (experience, education) or local specific environments.

Training implementation, as much as possible, built upon the experiences of the participants. Training session give facilitation of the learning and sharing from participant to participant (cross-fertilization), rather than just one-way communication from facilitator to participants. Participants should be actively involved in all phases of the learning process through group activities (discussion, self-learning, group work, presentation, seminar, exercise, etc.). In this context, role of training facilitators are central, they should have capability: (1) to give opportunity to participants to take part in all activities (2) to encourage the participants to be active, “force” them if needed (3) to improve the capability of the participants to be active through examples, stimulation, etc.
1.5. Teaching Equipment and Material

(1) White board, OHP and slide, chart, poster, leaflet, board marker
(2) Hand out, pen/pencil, notebook
(3) Field work manual, compass, measuring tape, spade, pen/pencil, paper

1.6. Curriculum

<table>
<thead>
<tr>
<th>No.</th>
<th>Subject</th>
<th>Allocated Time (@ 45 min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Theory</td>
<td>(50)</td>
</tr>
<tr>
<td>1</td>
<td>Introduction to the Course/Climate Setting</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>Policies on Forest Management and Forest Fire Prevention</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>Basic Principle of Forest Fire</td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td>Techniques of Forest Fire Prevention</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>Formation and Development of Group</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>Extension Methods and Aids</td>
<td>6</td>
</tr>
<tr>
<td>B</td>
<td>Practice</td>
<td>(74)</td>
</tr>
<tr>
<td>1</td>
<td>Inventory and Identification of resources for forest fire prevention</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>Mapping of forest fire sensitive areas and potential resources for forest fire prevention</td>
<td>20</td>
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<tr>
<td>3</td>
<td>Semi-structured interview on traditional wisdom in fire uses, group formation process and group mobility</td>
<td>10</td>
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<td></td>
<td>Action Plan for Extension Activities</td>
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<td>4</td>
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<td>5</td>
<td>Development of Extension Aids</td>
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<td>6</td>
<td>Development of Fire Warning Signs</td>
<td>10</td>
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<tr>
<td>7</td>
<td>Extension Activities</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>124</strong></td>
</tr>
</tbody>
</table>
CHAPTER II. THEORY

2.1. Climate Setting

**Objective:** To create a favorable situation (climate setting) for the participants and the facilitator to start the training.

**Methods:**
- Introduction among the participants and the facilitator
- Group dynamic games

**Allocated Time:** 4 x 45 minute divided into two sessions
- Ice Breaking
- Introduction to the course

2.1.1. Ice Breaking

This session aims to set up a relaxing and helpful situation in knowing each other (among the course mate) by using games. There are a lot of games available especially used for this session.

2.1.2. Introduction to the Training Course

This session give an overview on the background and objectives of the course, schedule and other related matters.

2.2. Policy on Forest Management and Forest Fire Prevention

**Objective:** To introduce participants to policy on forest management and forest fire prevention.

**Methods:**
- Lecture
- Discussion

**Allocated time:** 4 x 45 minute divided into two sessions
- Policy on Forest Management
- Policy on Forest Fire Prevention
2.2.1. Policy on Forest Management

This session aims to strengthen the idea of functions of forest, objective of forest utilization and policy on forest management. This will include; government policies on forest management and forest fire prevention, especially related to forest management policy in participant's area, for examples Protection Forest, Production Forest, Nature Conservation, etc. Therefore, forestry official responsible for forestry policy better delivers this subject.

The steps of subject delivery are as follow:

1. Facilitator starts the session by delivering subject on function and benefit of forest for human life. Use a chart or poster or cartoon showing the multi-use of forest.

2. Discuss the subject with the participants.

3. Review the discussion by delivering in-depth explanation on function and benefit of forest for human life:
   - Conservation and protection: land conservation, hydrology, preservation of gene-resources
   - Production/economic: forest products (timber, firewood, rattan, medicinal plants, etc.)
   - Social: recreation, places for indigenous people,
   - Ecological: supply of water, prevention of landslides and erosion, and biodiversity

4. Discuss also the division of function of forest based on the Government Laws and Regulations (Government Policies), e.g. Conservation Forest, Protection Forest and Production Forest.

2.2.2. Policy on Forest Fire Prevention

The purpose of this session is to discuss the importance of forest
protection and forest fire prevention (FFP), principles of FFP and policy on FFP.

(1) The essence of forest fire prevention
   a. Overcoming forest fire is obligation of all stakeholders related to forestry activities.
   b. The activities are emphasized in pre-fire activities: prevention, monitoring, awareness and readiness to decrease or lessen the impact caused by forest fire.

(2) Principles of FFP
   a. Principle of togetherness and voluntary
   b. Principle of coordination, synchronization, and integration
   c. Principle of autonomy/self-funding
   d. Principle of promptness and accuracy
   e. Principle of prevention and preparedness
   f. Principle of totality
   g. Principle of global

(3) The direction of policies
   Often forest fire becomes large and difficult to handle although in-conventional equipment are available. In order to implement forest fire prevention in line with sustainable forest management, the activities are directed:
   a. To prevent impact and losses caused by larger fires.
   b. To safe human life, government assets.
   c. To manage impacts after fires.
(4) Vision and Mission

a. Vision
   To control forest fire and to protect people from damages caused by forest fire.

b. Mission
   - To optimize the aspect of forest fire prevention
   - To improve monitoring, alertness and readiness
   - To improve aspect of rehabilitation of forest after fire
   - To enhance judicial aspect

(5) Targets of forest fire prevention

a. To master technology of prevention, monitoring, alertness, readiness, early warning system, early detection, early fire extinguishing, and post-fire handling.

b. To utilize all potential resources to overcome forest fire nationally supported by appropriate software and hardware.

c. To improve coordination and cooperation nationally, regionally and internationally.

(6) Normative steps of FFP

Steps of forest fire include: prevention, monitoring, preparedness, early warning, early detection, respond, and post fire management.

The chart below shows the steps/cycle of forest fire prevention.
Explanation:

(1). Prevention:

a. Social, cultural and economic approaches
The purpose is to enhance people awareness on forest fire danger. The activities include campaigns through TV shows, TV and radio talks, newspaper, demonstrations, etc., and community-based forest fire management.

b. Fire prevention techniques approaches
These include man-made green belt, natural break, fuels break, firebreak, controlled burning.

c. Forestry techniques approach
- Discipline in forestry knowledge implementation
- Development of fire-resistant infrastructures such as roads and water supply system.
- Selection of species in plantation and silvicultural techniques in natural forest.

d. Implementation
All stakeholders have obligation to participate in management of forest fires.

(2) Monitoring, Alertness and Preparedness

In dry season, monitoring of all aspects related to danger rating prediction and forest fire management should be done. Alertness is created by posting guard in fire tower and intensifying patrolling.

Preparedness is a step to prepare all resources by all stakeholders in managing forest fire before fire season.

The chart below explains steps of monitoring, alertness and preparedness.
(3) Early warning and detection systems

Early warning is a determination of condition from an analysis of factors influencing an area fire danger status. This consists of early warning and early detection.

Early warning consists of daily examination of map of forest fire-sensitive areas, analysis of weather, fuels and community dynamic, analysis of dryness index, warning signs, and coordination among stakeholders.

Early detection is an effort to obtain information of forest fire as early as possible through a simple to sophisticated technology.
This comprises of terrestrial detection and aerial or remote sensing. Terrestrial detection is done through patrolling in sensitive areas; tower examination while aerial sensing is done through the use of helicopter, aircraft and satellite.

Mechanism:

(4) Fire Attack

Fire attack is an activity to extinguish fire starting from planning to mop-up and patrolling.
Mechanism:

1. **EARLY DETECTION AND REPORTING**

2. EARLY ATTACK BY FOREST MANAGEMENT

   - ASSISTANCE

   - MOP-UP AND PATROLLING

   - RESOURCE MOBILIZATION IN SUB DISTRICT
     - ASSISTANCE
     - RESOURCE MOBILIZATION IN DISTRICT
       - ASSISTANCE
       - RESOURCE MOBILIZATION IN PROVINCE
         - ASSISTANCE
         - DISASTER

   - FIRE ATTACK RESPOND

   - DISASTER RESOURCE MOBILIZATION (NATIONAL, REGIONAL, INTERNATIONAL)
(5) Post-fire management

Post-fire management consists of activities conducted during the fires, after fires inactive and during the former fire sites still recognizable.

The activities included are fire cause investigation, fire impact management, law enforcement, and rehabilitation.

Mechanism:
2.3. Basic Principle of Forest Fire

**Objective:** To introduce the participants to the Basic Principle of Forest Fire (factors affecting forest fires, causes and impacts of forest fires)

**Methods:**
- Lecture
- Discussion

**Allocated time:** 6 x 45 minute divided into three sessions:
  a. Cases of Forest and Land Fires
  b. Concept of Fire Triangle
  c. Causes and Impacts of Forest Fires
  d. Intensity of fire spread and types of forest fires

2.3.1. Cases of Forest and Land Fires

In this session the participants are divided into small groups (@ 5 persons) and asked to discuss causes and impacts of forest and land fires. Topics to discuss can be:

Group 1:

a. The causes of forest fires.

b. How to open and clear lands *(Give an example on a careless way to clear land)*.

c. Compare the example with the practice in participant area's common practices.

Group 2:

a. The impacts of forest fires.

b. Who are affected by the fires and who should be responsible?

c. How if forest fire occurs in your area? *(What should community in your area do)*?
2.3.2. Concept of Fire Triangle

Three main causes of forest fires:
   a. Fuels
   b. Heat
   c. Oxygen \((O_2)\)

Interrelation among these three factors is often called “Fire Triangle”. Without one of them fire will not occur. Fire needs dry fuels, enough heat, and enough oxygen to start combustion.

This concept also guides ways to stop fires. By separating or minimizing one of them fires will not start. Minimizing fuels is done by making ‘fire breaker’ to separate from heat sources. Heat is minimized by maintaining humidity (e.g. by watering). Oxygen is minimized by covering fire with soil. Textbox below provide a simple demonstration of fire triangle.

<table>
<thead>
<tr>
<th>Demonstration of Fire Triangle</th>
</tr>
</thead>
</table>
| Provide a candle and matches. We have all three factors to start fire: fuel (candle), heat source (matches) and Oxygen (available freely in atmosphere).
| Provide a glass taller than the candle. Lit the candle and cover it with the glass. After sometime the fire will turn off. This is caused by disappearance of Oxygen in a limited space covered by glass. This shows that unavailability of one of the factors of fire triangle will make easier to stop fires. |

2.3.3. Causes and Impacts of Forest Fires

Start the session by digging participants’ knowledge and experiences and jogging their memories on causes and impacts of forest fires. Proceed with discussion in the classroom.

Ask the participants to write down history of forest fires in their areas in recent years.
2.3.3.1. Causes of Forest Fires

Because Oxygen is freely available, we only focus discussion on fuels and heat.

(1) Fuels

Fuels are the most dominant factor in starting fires. Fuels availability in forest and its relation to forest fires should be considered. Below are classifications of fuels in several types of forest.

a. Primary forest

In this type of forest, litter is thin, humidity is high and the temperature is low because crown cover is almost 100%. Sunrays on forest floor are almost 0%.

b. Logged over areas

In logged over areas, litter is thick. This is caused by leftover of logging activities. This thick litter is under open crown. In dry season the humidity is low while the temperature is high, so that litter is easily burnt. In a long dry season fires are difficult to stop.

c. Plantation forest

In young plantation forests with crown cover less than 100%, fuels are available in term of grasses and shrubs. As in logged over areas in dry season temperature in forest floor is high. Risk of fire is also high.

d. Peat forest

In peat forest the fuels are the peat itself located under the ground surface. In rainy season, peat land are usually immersed in water. In a normal dry season, only upper layer is dry. Fire is not easily happened. However, in long dry seasons, deep layers
of peat (can reach tens of cm) are dry and are easily burnt. If this happens, although slow, peat fires are difficult to stop.

e. Grassland and shrub

Litter in grassland and shrubs are sensitive to fires even in normal dry seasons. Because fuels are not abundant, usually fire is not as big as in peat forest and logged over areas.

(2) Heat

Heat is closely related to fire or flame sources. Generally it is estimated that around 90% of fire sources come from human activities. The rests is brought about by natural causes.

a. Human factor

Human can be a factor of fire because of their carelessness or their deliberateness.

Examples of carelessness:
- Farmers prepare their farmlands through burning or slash and burn;
- Hunter, grasser, fire wood collectors go to forest using fire for illumination or to gather honey;
- Cigarette or fire remnants;
- Uncontrolled burning in plantation.

Examples of deliberateness:
- Process of forest conversion into farm land and settlement using fire as cheap ways to clear land;
- Process of forest conversion into plantation and land clearing using fires;
- Disappointment of community on plantation projects.
b. Natural factor
- Climate (long dry seasons, El-Nino phenomenon)
- Thunderstorm, volcanic activities and other natural causes.

2.3.3.2. Forest Fires Impact

(1) Smoke
Smoke causes illness in human respiratory system, and transportation disruption. It also becomes regional problem since smoke can travel to neighboring countries.

(2) Impacts on forest and environment
- Fires affect forest ecosystem and biodiversity. Fires disturb five ecological processes in forest such as natural succession, organic material production and decomposition, nutrient cycle, hydrology cycle, and land formation.
- Burnt trees will decrease Carbon dioxide absorption. This will increase green house effect and decrease microclimate function of the forest.
- Fires decrease biodiversity. Fires also affect reproduction activities of some primates, amphibian and reptilian.

(3) Economic losses in term of destruction of stands, non-wood forest products, fruits.
- Agriculture sector losses
  Productivity of some agriculture commodities is affected by smoke generated from forest fires. Productivity of oil palm tree in Jambi, Sumatra, Indonesia, for example, in three years decreases about 55% after forest fire.
- Social impact
  Forest and land fires affect local community social and
economic activities. When these activities are disturbed, they will try to find easy alternatives that will cause other negative impacts.

2.3.4. Intensity of Fire Spread and Types of Forest Fires

2.3.4.1. Intensity of Fire Spread

Although it is believed that most of forest fires are caused by human activities, intensity of fire spread is intensified by natural condition such as characteristics of fuels, weather condition and topography.

(1) Characteristics of fuels

Knowledge on fuels is important in answering question: "How can we prevent fires?"

a. Fuels and their availability

- What kind of plants is sensitive to fires? Trees, shrubs or grass? Trees and timber are not as easily burnt as grass.
- Death plants are easier to be burnt than the live ones.
- How much are the fuels?
- Types of land-covering plants.

b. Fuel humidity

Rather dry living trees/plants will be easily burnt and humid death plants will not be easily burnt.

c. Fuel composition and structure

- Standing fuels are easier to burn than the laying ones because of more Oxygen supply.
- Dispersed fuels decrease the spread of fires.
- Small and dry fuels speed up combustion. Solid fuels slow down combustion
(2) Weather condition
Weather condition before and during fires will determine how the fires start and behave.

a. Temperature
Hot weather before and during fires facilitate fires and make it difficult to stop.

b. Wind
The stronger the wind the more difficult to manage the fires. Wind pushes flame to touch fuels in the front and make it jumps. Wind also supplies more Oxygen and helps to dry fuels.

c. Humidity
Rain and high humidity make fuels wetter and slow down fires.

(3) Topography

a. In steep slopes flame become closer to fuels in the front so that fire spread easily that on the flat surface.

b. Generally in South East Asia, east-facing slopes receive more heat in the morning. When fire occurs in this slope it is difficult to manage in the morning. In west-facing slopes, on the other hand, receive more heat in the afternoon. Fire in this slope is more difficult to handle in the afternoon.

Rule of thumbs: slope vs. fire spread
The steeper the slope the quicker is the speed of fire spread.

2.3.4.2. Types of Forest Fires
Based on the source of fires, forest fire can be divided into two:

(1) Ground fire
This kind of fire is caused by coal (e.g. in east Kalimantan,
Indonesia), bauxite and peat. Although this type of fire is slowly spread, it is difficult to stop.

(2) Surface fire

This fire occurs because of shrubs, grass, logging waste burning. Normally the speed of fire spread is about 4 - 7 km per hour, but if strong wind blows on steep slope, it can reach 10 km per hour.

2.4. Techniques of Forest Fire Prevention

| Objective: | To discuss methods of forest fire preventions, identification techniques and mapping of forest fire-sensitive areas |
| Methods: | - Lecture  
- Discussion |
| Allocated time: | 10 x 45 minute |

2.4.1. Identification Techniques of Forest Fire-Sensitive Areas

(1) Definition:

Forest fire-sensitive areas are areas where elements and factors causing fires are available in a sufficient amount to start fire. Characteristics of these areas are:

a. Availability of potential fuel (e.g. grassland and cleared area for farm)

b. Human activities using fires (e.g. camping, hunting, farming)

c. Long drought

(2) Identification

Forest fire prevention program should be started with identification of forest fire-sensitive areas and the results are drawn in a sketch or a simple map. The sketch is used as a base in
forest fire prevention plan. The checklist below is useful for identification:

<table>
<thead>
<tr>
<th>Checklist for fire-sensitive areas:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Why do fires frequently occur?</td>
</tr>
<tr>
<td>b. Where do the fires happen?</td>
</tr>
<tr>
<td>c. What activities are done?</td>
</tr>
<tr>
<td>d. Where the activities are done?</td>
</tr>
<tr>
<td>e. How often the activities are done?</td>
</tr>
<tr>
<td>f. What natural factors caused the fires?</td>
</tr>
<tr>
<td>g. When do the fires usually happen?</td>
</tr>
<tr>
<td>h. What months do dry season usually take place?</td>
</tr>
</tbody>
</table>

To answer these questions, the participants need to be facilitated to identify fire-sensitive areas using Participatory Rural Appraisal (PRA). Some PRA techniques are described below:

(1) History of Fires in the village

History of forest fire occurrences in and around the village is a good means to illustrate and facilitate rural people in discussion of incidents that happened in the area indicated the sensitivity to fires.

Information that can be dig from this history is:

a. Chronology of forest fires in recent years
b. Story based on facts on causes of fires
c. Story based on facts on impacts or losses of forest fires
d. Story based on facts on community participation in fire prevention

Steps in discussion:

a. Explain about objectives of the process of history making
b. Discuss with the participants about forest fires that occurred in their village (in practice/field work interview village elderly)
c. Complete the information by asking the causes, the impacts, and how people cope with it during and after the fires
d. Ask them to start writing the history in a flip chart
e. Write the history chronologically
f. Discuss further to dig participants' responds and perceptions

(2) Village Transect

Transect is done by walking through the village following a certain pattern to get information as complete as possible. The results of observation are presented in a chart for further discussion.

Output of information:
a. Land use pattern
b. Land ownership status
c. Vegetation
d. People activities
e. Fires potential

Steps:
a. Prepare team to conduct village transect.
b. Prepare material and tools.
c. Determine transect lines.
d. Travel and observe condition along the lines. Interview the local people met during observation.
e. Take notes on observation in each location.
f. Draw the results.

(3) People Mobility map

This map shows location of people activities and frequency of mobility in their daily life that could influence the emergence of fires. This is done by collecting information (direct information or interview) on local people and outsiders' daily
activities to estimate the fire sensitivity.

Output of information
a. Where do people go to do their activities?
b. What kind of activities do people have and how often?

Steps:
a. Explain about local people and outsiders’ mobility to know where they go.
b. In a flip chart, draw position showing where people live.
c. People mobility can be drawn with the help from local people.
d. Put arrow to show people activity.
e. The number of arrow shows frequency of mobility in a certain activity.

(4) Season calendar

Season calendar for the purpose of identification of fire-sensitive areas is a tool to identify critical periods that facilitate forest fires. This calendar can be used to reveal relation between dry seasons and people activities that can trigger danger of fires.

Output of information: people activities from January to December.

Steps:
a. Explain the purpose of this activity.
b. Discuss with the participants about dry seasons and fire danger.
c. Identify people activities in the dry seasons.
d. Ask the participants to draw a season calendar in a flip chart.
e. Analyze the calendar, e.g.:
   - (What causes fires?
- Is there any relation between season and fires?
- What is possible solution?)
f. Write down all problems, potential and information related to fires causes.

2.4.2. Techniques of Forest Fire Prevention

Start this session with an exercise to refresh participants' memories and dig up their knowledge on forest fire prevention. Follow with a discussion. To facilitate them use the following questions:

<table>
<thead>
<tr>
<th>Checklist: efforts in forest fire prevention</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Are people familiar with means of forest and fires prevention?</td>
</tr>
<tr>
<td>• Is there any forest and land fires extension activities/campaigns?</td>
</tr>
<tr>
<td>• Do people involve in forest management with government officials or forest concession?</td>
</tr>
<tr>
<td>• Do people know how to conduct controller burning? What people's activities that caused fires?</td>
</tr>
<tr>
<td>• Do people know how to make fire break?</td>
</tr>
<tr>
<td>• Do people know how to make green belt to prevent fires?</td>
</tr>
<tr>
<td>• What efforts that people usually do to prevent forest and land fires?</td>
</tr>
</tbody>
</table>

2.4.2.1. Definition and scope

(1) Forest fire prevention is all efforts, actions or other activities in order to prevent or reduce possibility of forest fires.

(2) Fire anticipation is an early step in system of forest fire prevention. The program includes:
a. Prevention to reduce fire risk, including: education and other activities
b. Pre-attack by reducing fuel spread and creating fuel break
c. Fire attack
d. Forest fire prevention activities are directed to community and the areas where they live which have direct or indirect impacts.
2.4.2.2. Efforts in forest fire prevention

(1) Social, cultural and economics approaches
To motivate and to encourage people involvement are the best way out in forest fire prevention. These approaches emphasize effort in enhancing people awareness on the danger of forest fires. These can be done through:

(2) Campaigns, extension activities, socialization

(3) Community-based forest fire management

2.4.2.3. Technical approaches
In fire terminology, technical approaches are all efforts, either facilities or activities directly useful in reducing fire risks. These include:

(1) Development of man-made green-belt

(2) Maintenance of natural fire break

(3) Development of fuel break

(4) Development of fire break

(5) Fuel management

(6) Plant management

2.4.2.4. Forest management approaches
The success of forest management (including forest fire management) is interrelated to the discipline in application of forestry science in general. Clear regulation and law enforcement are fundamental in forest fire prevention. Development of fire-resistant infrastructure and selection of tree species are also essential in managing fires.
2.5. Formation and Development of Group

**Objective:** After taking this subject the participants are expected to improve their knowledge and skills in group-formation especially in forest fire prevention

**Methods:**
- Lecture
- Discussion

**Allocated time:** 6 x 45 minute

2.5.1. Group Formation

Community support and participation are key factors in achieving success in land and forest fire management, especially forest fire prevention. Land and forest fire management are suggested to be institutionalized in non-formal community institutions/groups. Special institution should not manage this. More important is that the efforts can be empowered through existing institution. Considering this, community empowerment strategy should be stressed in the discussion.

1) Community Empowerment in Forest Fire Prevention

Community development should be considered as community empowerment and not only 'a one-time project' where it ended when there is no more assistance from outside. A good program in forest fire prevention should be directed toward improving community capability and creating self-reliance.

Empowered community is a community with strong mental ability, educated and has a good intrinsic value. These values are important sources of empowerment such as cooperation and teamwork.

2) Identification

The first step in group-formation is to identify socio cultural
condition, characteristics and custom in the community. Required information can be gathered through direct examination and interview. Examination and interview gathers information as follow:

1. Frequency of member of community entering forest areas to gather forest products (rattan, resin, gum, nuts, honey, fish, etc.).
2. People income.
3. Custom/tradition related to land preparation form farm or garden.
4. People opinion on forest.
5. Favorite trees for people.
6. Agriculture patterns.
7. Traditional wisdom.
8. Expected environmental condition.
9. Problem faced by the community related to their income.
10. Community togetherness.
11. Relation with local forest services.

(3) Formation of Group

Results of identification are used as bases for group formation. The facilitator can develop criteria and system of classification of community members. The next step is to approach the individual and persuade them to form a group. The facilitator should support with motivation. Member of a group should not exceed 30 peoples and should reside in nearby locations.

Formation of a group should be done by its members. They should elect their own leaders.
The group should give benefits as follow:

1. As empowerment unit in overcoming all challenges and threats.
2. As a place to build togetherness.
3. As a learning media in exchange of experiences of their productive activities.
4. As media for information socialization.

(4) Strengthening the Group

Strengthening the group can be done by:

- Conducting regular meetings to discuss useful activities
- Formulating “rule of the game” and norms
- The group should work with principle of “by and for the member”. The extension worker is the facilitator.
- There should be few members as the motivators.
- Selection of productive business should be based on identification results and member capabilities.

2.5.2. Principles of Facilitation

Facilitation is defined as doing activities with people in examining real problems faced by community and discussing possible solutions. It can also be interpreted as a process to smarten the community and one model of extension in order to empower them.

Facilitation is meant to build people awareness on context of a problem, develop critical thinking and get a wise decision.

It should be noted that facilitation would not last forever. There should be a target to reach so that the facilitator knows how to facilitate it.
Ideally, facilitation should end when the community is able to do something as targeted.

Requirement of a facilitator:

1. Easy going.
2. Patient and is not easily desperate.
3. Aware about the community, willing to listen to and learn with them.
4. Capable to build equity with community.
5. Capable to motivate people.

Steps in Facilitation:

1. Introduction.
2. Motivate the community to communicate and in dialogue.
3. Dig information from the community (problems and needs). This can be done through PRA. More information can be gathered with PRA:
   a. Village profile.
   b. Village potential.
   c. Farming pattern.
   d. Social and economic institutions in the village.
   e. Social and economic activities in the village.
   f. Other relevant information.
4. Motivate the formation of community institution.
2.6. Extension Methods and Tools

**Objective:** After taking this subject the participants are expected to be familiar with and choose proper methods and tools in extension especially on forest fire prevention.

**Methods:**
- Lecture
- Discussion

**Allocated time:** 6 x 45 minute

2.6.1. Extension Method

Extension is often done through facilitation. Community facilitation is a learning process by giving motivation and support to the community so that they can identify their own potentials and are courageous to take action to improve their quality of life. To achieve this goal, every facilitating activity should contain components such as; material, methods, aids and comfortable situation for facilitation.

Conditions to improve community participation:

1. Presentation of visual information.
2. Facilitator should not dictate his/her opinion.
3. Appropriate use of methods and techniques.

Generally there are three methods of facilitations:

1. Facilitation methods based on the media used.
2. Facilitation methods based on the relationship between facilitator and target.
3. Facilitation methods based on analysis of the target psychosocial.

Facilitation methods based on the media used:

- Oral, directly (face to face) or by telephone, or indirectly (by radio, television or cassette tapes).
- Print media, through magazines, newspapers, posters, photos, etc.
- Projected media: film, slideshow, etc.

Facilitation methods based on the relationship between facilitator and target:
- Direct communication: direct talk orally, or through telephone or facsimile which enable the communicators to get responds in a relatively short time.
- Indirect communication through third parties, either human or other medias, which prevent the communicators, to get responds in a relatively short time.

Facilitation methods based on analysis of the target psychosocial:
- Individual approach
- Group approach
- Mass approach

Each method has its own strengths and weaknesses. The table below gives a summary of methods:

<table>
<thead>
<tr>
<th>Function/characteristics of Facilitation Methods</th>
<th>Mass Media</th>
<th>Talks</th>
<th>Demonstration</th>
<th>Local People Media</th>
<th>Group Discussion</th>
<th>Dialogue</th>
</tr>
</thead>
<tbody>
<tr>
<td>To raise awareness for innovations</td>
<td>Xxx</td>
<td>x</td>
<td>xx</td>
<td>xx</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>To raise awareness on their own problem</td>
<td>O</td>
<td>x</td>
<td>xx</td>
<td>xxx</td>
<td>xxx</td>
<td>xxx</td>
</tr>
<tr>
<td>Transfer of knowledge</td>
<td>Xxx</td>
<td>xx</td>
<td>xx</td>
<td>xx</td>
<td>x</td>
<td>xx</td>
</tr>
<tr>
<td>Changing of behavior</td>
<td>O</td>
<td>o</td>
<td>xx</td>
<td>x</td>
<td>xxx</td>
<td>xxx</td>
</tr>
<tr>
<td>Application of other people knowledge</td>
<td>O</td>
<td>0</td>
<td>x</td>
<td>xx</td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>
Extension/Facilitation Techniques

Extension/Facilitation techniques relates to the methods used. Some examples below are often used:

1. For mass methods use speech or exhibition.
2. For group approach use discussion, seminar workshop or comparative studies.
3. For individual approach use home or office visits.
4. If using media use print (leaflet, booklet, brochure), electronics (radio and television), and other media (warning signs).

Principles of facilitation to increase community participation:

1. Sharing of learning experiences.
2. Community is the main actor.
3. Facilitator should come from different background.
4. Flexible implementation.
5. Comfortable atmosphere.
6. Information crosscheck.
7. Discussion of field results.
2.6.2. Extension Tools

Extension is a non-formal learning process consisting of some related components in achieving the stated goals. Achievement of goals or objectives is not the only determining factors. Other components are target, materials, tools, display and situation or condition where the extension is conducted.

Extension tools are tools used to make the communication and interaction more effective. Extension displays are extension aids that can be touched, seen, smelt, heard so that the target understand what is being delivered.

Uses

Extension tools:

- Can overcome the limitation of target experience.
- Can reach larger space.
- Facilitate direct interaction between the target and his/her environment
- Give comprehensive experience.
- The target can transform knowledge and skill through her/his senses.
- Can raise motivation and stimulation to learn.
- Can produce uniformity in examination and interpretation.
- The target can improve his/her capability in differentiating and interpreting with symbols.

Displays

Usually these are used in combination. Displays should be easy to understand by the target and the ideas should be easily captured.

The appropriately used displays will:
- Avoid misunderstanding or misinterpretation
- Clarify the explanation
- Give longer impression
- Catch and focus the interest
- Give strong motivation to apply what is suggested

Classification of displays:

1. Original or real, death or living things, including: fish in an aquarium, potted plants, insectariums, herbarium, etc.
2. Imitations: miniatures, scale models, dioramas, statues, cross section of a model.
3. Drawings, caricatures, illustrations, leaflets, folders, poster, etc.
4. Projected drawings: films, slides, photos, etc.

Development and Uses of Displays

General guidelines of development of displays:

1. Making simple drawings/pictures:
   a. Copy with thin, transparent paper
   b. Scale copying
   c. Cut and paste pictures from magazines, newspapers

2. Tools and materials to make words and pictures:
   a. Good paints
   b. Colored pencils
   c. Black ink
   d. Brush
   e. Silk print, etc.
2.6.3. Development of Extension Activity Plan

Individual extension activity plan is developed by an extension worker to support his/her group program implementation. Extension program is a longer-term plan (at least covering one year activities) developed by the group. The program is formulated at sub-district, district, provincial or central levels. Extension plan can be interpreted as:

1. Extension plan for only one package, at a certain meeting with target group.
2. Working plan.

Extension plan should be aimed at local problem in the areas.

Steps in plan formulation:

1. Observation of physical condition of the village: the existence of fire-sensitive areas, distance to forest areas, soil fertility, and resource potential.
2. Observation of local community condition: education level, custom or tradition, village institutions, and local wisdom.
4. Finding possible alternatives of problem solution, for example: better farming patterns, productive activities to improve people's incomes, wise use of fire, etc.
5. Determining extension strategy.
6. Formulating activity plan, including methods, techniques, and tools/displays.
3.1. Inventory and Identification, and mapping of resources for forest fire prevention and suppression.

**Objective:**
After taking this subject the participants are expected to be able to conduct
(1) Inventory and Identification of resources for forest fire prevention and suppression.
(2) Simple mapping (sketching) of resources for forest fire prevention and suppression.

**Main topics:**
(1) Techniques of inventory and identification of resources for forest fire prevention and suppression.
(2) Techniques of simple mapping.

**Material and Tools:**
Compass, area/location map, measuring tape, village map, ruler, notebook, paper and pencil/pen.

**Procedure:**
(1) The participants are divided into three groups.
(2) Each group is assigned to make a village land use sketch.
(3) Write down all resources related to resources for forest fire prevention and suppression, such as rivers, dams, ponds, roads, bridges, bare lands, vegetation domination, water tanks, fire fighting equipment. Emphasize on type, description, function, condition and location.
(4) Integrate the resources on point 5 to the sketch.
3.2. Semi-structured interview on traditional wisdom in fire uses, group formation process and group mobility.

Objective: After taking this subject the participants are expected to be able to conduct semi-structured interview.

Main topic: Techniques of interview on collecting information of traditional wisdom in fire uses, group formation and development, people's activities and rules in the community.

Material and Tools: notebook, pen/pencil, manila carton, markers, and rulers.

Procedure:
- a. Collect data and information on traditional wisdom related to fire uses, fire prevention, rules and sanctions, and related institutions.
- b. Identify and map local people's mobility.
- c. Collect data and information on process of group formation and development and community roles in forest fire prevention and suppression.
- d. Collect data and information on farming technology related to fire uses.
- e. Collect information on people social and economic condition.
- f. All data and information above are analyzed and reported as bases for formulation of extension plan.

3.3. Development of Action Plan and Tools/Displays/Aids for Extension Activities

Objective: After taking this subject the participants are expected to be able to:
1. Formulate an extension activity plan
2. Develop extension aids/displays

Main topics:
1. Extension Preparation Sheets and extension activity plan.
2. Simple techniques of extension aids/displays development.
**Material and Tools:**
Extension Preparation Sheets, markers, brush, paint, manila carton, rulers.

**Procedure:**
(1) Each group is assigned to formulate extension activity plan consisting of: Extension Preparation Sheets, extension methods and techniques, location and schedule.
(2) Each group develops extension tools/display.

3.4. Evaluation of Fire Warning Signs

**Objective:** After taking this subject the participants are expected to be able to conduct evaluation of Fire Warning Signs in their areas.

**Main topic:** Fire Warning Signs

**Material and Tools:** compass, measuring tape, village map, notebook, rulers, brush and three-play plywood.

**Procedure:**
a. Invent and identify available signs in the field: types, descriptions, and functions.
b. Evaluate the signs.
c. Develop forest fire signs.

3.5. Extension Activities

**Objective:** After taking this subject the participants are expected to be able to conduct an extension activity in their areas.

**Main topic:** methods and techniques of extensions

**Material and Tools:** pen/pencil, extension activity plan, tools and displays.
**Procedure:**

a. Assign the participants to do extension with certain target group.

b. Determine the schedule based on the target groups.

**REFERENCES**


Appendix 1.

Hand Out: Resource Potential for Forest Fire Suppression

Resource potentials for forest fire suppression are all resources available in and around forest areas usable for supporting every effort in forest fires prevention and suppression.

To be familiar with quantity and quality of these resources is important in improving alertness in forest fire prevention efforts. Possible resources can be classified as follow:

1. Rivers, lakes and ponds
   These resources can be used as natural fire breaks, as anchor point or as starting point for fire prevention. Required information is:
   a. Coordinates of locations
   b. Lengths, widths, total areas, or other measurements
   c. The depth of water in the dry season
   d. Which areas still contain water in dry season
   e. Topography and vegetation in the areas
   f. Distances of some important point as base camps, main road, triangulation points, villages, etc.

2. Roads
   Roads are important in supporting transportation. Road can also be used as man-made fire breaks. Required information is:
   a. Length and widths
   b. Connection to forest management facilities
   c. Maximum capacity or road class
   d. Condition (slippery in rainy season, dusty in dry season)
   e. Road network

2. Bridges
   Bridge condition determines the smoothness of forest fire
prevention and suppression. Required information is:
   a. Length and width
   b. Capacity
   c. Permanent or temporary, if temporary what is the material

3. Canyon/gorge

   In fire suppression operation, gorge can be used as natural fire breaks. Required information is:
   a. Depth
   b. Vegetation condition

4. Bare lands

   Almost the same with canyon/gorge, the bare lands are important as natural fire breaks. However, bare lands often have specific wind patterns that should be considered in fire occurrences.
   a. Total areas
   b. Vegetation condition
   c. Local wind pattern

5. Domination of vegetation

   Information on vegetation is important in finding way out or routes of escape during fires occurrences. This may also supply information on possible leaves as tools for fire suppression.

6. Hydrant

   Hydrant is water supply for all needs, including improving alertness in dry seasons. Hydrant may also be found in urban areas. Required information is:
   a. Hydrant network map
   b. Technical information or operational guidelines

7. Water tanks

   These may be found in plantation areas. These have double functions, as water supply for nursery and fire prevention in dry...
seasons. Required information covers:
  a. Volume of water and network if available
  b. Locations
  c. Accessibility
  d. Operational guidelines

8. Guard towers

These towers are important for forest fires' early detection. Required information contains:
  a. Height and covering reach
  b. Strength
  c. Comfort ability
  d. Facilities: binocular, map, compass, etc.

9. Tools and equipment

Information on availability of all tools and equipment is important in developing resources database for forest fire prevention and suppression. This will be used to prepare strategy for forest fire prevention and suppression. Required information should cover:
  a. Name and function
  b. Quantity and condition
  c. Distribution
  d. Responsibility
  e. Procedure for maintenance
  f. Location

10. Base camp, working camp

These camps can be used as center of activities in the field. Required information includes:
  a. Physical condition
  b. Capacities
  c. Facilities
  d. Distance from key points.
Mapping of Resources for Forest Fire Suppression

If the areas already have had location map, this map can be used in forest fire suppression activities. The map can be modified to accommodate information on resources mentioned above. The information should be written in an appropriate way as legend. Details can be attached in separate attachments.
Appendix 2.

Hand out: Fuels Management

Fuels management is a method to decrease fuel flammability and difficulties in forest fire suppression. Fuels management can be done mechanically, chemically, biologically, or by using fire.

Fuel treatment is the manipulation of fuels so that they will not easily burn by cutting, chipping, piling or burning them.

Objective of Fuels Management:

a. To prevent forest fire.
b. To decelerate the fires
c. To decrease the ignition
d. To reduce smokes
e. To create not-too-hot environment during fire suppression operation
f. To facilitate fire suppression operation

Types of Fuels Management:

1. Fuels modifications

These are done to change fuels characteristics so that they cannot easily burn or if fires happen the fires will be slower.

Common practices are by cutting, chipping, or powdering the fuels, cutting under plants periodically, crushing the grasses, strip weeding, pruning, or watering

2. Fuels reduction

Fuels reduction is done to decrease their quantity by utilizing logging waste, speeding up decomposition process or controlled burning.
3. Fuels isolation

This is an activity to isolate a forest area (as fuel resource) from other forest areas (as other fuel resources) and or divide a forest area to become smaller areas. The objective is to slow down fires.

There are two kinds of isolation: natural and man-made. Natural isolation rows are rivers and hilltops. Man-made isolation rows are fire-breaks, fuels-breaks and green belt.

a. Firebreaks

Firebreak is a clear land for reducing fire speed. Others are rivers, block boundaries, or specially made row free of vegetation.

b. Fuels breaks

These breaks are wide row of land where the vegetation has been changed to low-fuel volume vegetation such as grass and other short plants.

c. Green belts

These are the modification of fuels breaks where the vegetations are short trees or shrubs/bushes. Threes should be fire resistant, evergreen, have big crown to prevent weeds, easily re-growth, and if possible have multi uses.
Appendix 3.

Hand out: Guidelines in Development of Forest Fires Signs

1. Size and form
   a. Rectangle, 1.00 x 1.20m or proportionally bigger
   b. Use simple drawings in the signs, in a circle and give writing as needed

3. Material
   Use appropriate available materials in the areas.

4. Colors (example)
   a. Base color : light green
   b. Background : light blue
   c. Flame : yellow, red and dark red
   d. Drawings : black, dark brown and other colors (choose contrast ones)

5. Classification
   a. Warning signs: fire danger index, forest fire sensitive areas
   b. Prohibition signs: no smoking, to fires, no throwing cigarettes
Appendix 4: Tables for Data Collection and Reporting During Fieldwork

1. Basic Data on Skilled Human Resources

<table>
<thead>
<tr>
<th>No</th>
<th>Name</th>
<th>Institution/Village</th>
<th>Basic</th>
<th>Qualification / Level of Training</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Intermediate/Advanced</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Prevention</td>
</tr>
<tr>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td></td>
</tr>
</tbody>
</table>

2. List of Contacts of Important Persons in Related Institutions

<table>
<thead>
<tr>
<th>No</th>
<th>Name</th>
<th>Institution/Village</th>
<th>Office Address</th>
<th>Office Telephone/telephone</th>
<th>Home Address</th>
<th>Home</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
<td>(7)</td>
</tr>
</tbody>
</table>

3. List of Members of Forest Fire Brigade

<table>
<thead>
<tr>
<th>No</th>
<th>Name or nickname in the group</th>
<th>Name of Group leader</th>
<th>Address of Group leader</th>
<th>Number of personnel</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
</tr>
</tbody>
</table>
4. List of Natural/Man-made Potential for Forest Fire Prevention and Suppression

<table>
<thead>
<tr>
<th>No</th>
<th>Types</th>
<th>Deskripsi</th>
<th>Location</th>
<th>Coordinates</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dam</td>
<td>Total areas: Max. depth Min. depth: Other details:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Ponds</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Rivers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. List of Important Locations/Sites for Forest Fire Prevention and Suppression

<table>
<thead>
<tr>
<th>No</th>
<th>Important Locations/Sites</th>
<th>Description</th>
<th>Location</th>
<th>Coordinates</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nursery</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Archaeological sites</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Research stations</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Springs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Basecamp</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Breeding</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Habitat of endangered orchids</td>
<td></td>
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</tr>
<tr>
<td>8</td>
<td>Habitat of other endangered Fauna/Flora</td>
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<tr>
<td>9</td>
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</table>

6. List of Rivers in the Forest Areas

<table>
<thead>
<tr>
<th>No</th>
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<th>Length</th>
<th>Depth</th>
<th>Connecting .... to .....</th>
<th>Remarks</th>
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<tbody>
<tr>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
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<td>(6)</td>
</tr>
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</table>
7. Road Network/Pathway in the Forest Areas

<table>
<thead>
<tr>
<th>No</th>
<th>Road name</th>
<th>Length</th>
<th>Width</th>
<th>Connecting to</th>
<th>Remarks</th>
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<tr>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
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</tr>
</tbody>
</table>

*Develop other data to enrich.*

8. List of Equipment for Forest Fire Prevention

<table>
<thead>
<tr>
<th>No</th>
<th>Types</th>
<th>Quantity</th>
<th>Location of storage</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>Helmet</td>
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</tr>
<tr>
<td></td>
<td>Shoes</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Gloves</td>
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<td></td>
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<tr>
<td></td>
<td>Canteen</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fire retardant vest</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Torches</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Backpack</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Mask</td>
<td></td>
<td></td>
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</tr>
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<td></td>
<td>Goggles</td>
<td></td>
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<tr>
<td></td>
<td>Horn</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>First aids</td>
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<tr>
<td></td>
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9. List of Tools for Forest Fire Suppression

<table>
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<th>Condition</th>
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<tr>
<td>(1)</td>
<td>Blower</td>
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<td>(4)</td>
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<td>Spade</td>
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<td>2</td>
<td>Bush hook</td>
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<td>3</td>
<td>Sharp hook</td>
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<td>Quantity</td>
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<td>Condition</td>
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<td>------------------</td>
<td>----------</td>
<td>---------------------</td>
<td>-----------</td>
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<tr>
<td>1</td>
<td>Portable Pump</td>
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<td>Fire Engines</td>
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<tr>
<td>3</td>
<td>Tractors</td>
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<td>Chain-saws</td>
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<td>5</td>
<td>Buldozers</td>
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<td>7</td>
<td>Excavators</td>
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<td>8</td>
<td>Skidders</td>
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<tr>
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11. List of Semi Mechanical and Mechanical Communication Equipment

<table>
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<th>No</th>
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<tbody>
<tr>
<td>1</td>
<td>Radio SSB</td>
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</tr>
<tr>
<td>3</td>
<td>Telephone</td>
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<tr>
<td>4</td>
<td>Facsimile</td>
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</table>
### List of Semi Mechanical and Mechanical Equipment for Forest Fire Suppression

<table>
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<th>Location</th>
<th>Condition</th>
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<td>(1)</td>
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</tr>
<tr>
<td>1</td>
<td>Water containers</td>
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</tr>
<tr>
<td>2</td>
<td>Guarding tower</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Binoculars</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Compasses</td>
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<td></td>
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<td>5</td>
<td>Guard post</td>
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<td>6</td>
<td>Working hut</td>
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<td>7</td>
<td>Tents</td>
<td></td>
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</tr>
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<td>8</td>
<td>First aids</td>
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</tr>
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<td>9</td>
<td>Map</td>
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<td>10</td>
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### List of Transportation Equipment for Forest Fire Suppression

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<th>Condition</th>
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<tbody>
<tr>
<td>(1)</td>
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</tr>
<tr>
<td>1</td>
<td>Speed Boat</td>
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<tr>
<td>2</td>
<td>Motorized boat</td>
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<td></td>
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</tr>
<tr>
<td>3</td>
<td>Truck</td>
<td></td>
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</tr>
<tr>
<td>4</td>
<td>Pick up</td>
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<td>5</td>
<td>Motor cycle</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>6</td>
<td>Cars</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>7</td>
<td>Other</td>
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</table>
14. List of Equipment for Forest Fire Suppression in Related Institutions

<table>
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<tbody>
<tr>
<td>(1)</td>
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</tr>
<tr>
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<td>List of Tools</td>
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<tr>
<td>2</td>
<td>List of Mechanical Equipment</td>
<td></td>
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</tr>
<tr>
<td>3</td>
<td>List of Transportation Equipment</td>
<td></td>
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<td>4</td>
<td>List of Communication Equipment</td>
<td></td>
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<tr>
<td>5</td>
<td>List of Other Facilities</td>
<td></td>
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<td>6</td>
<td>Others</td>
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15. Frequency of Fire Occurrences and the Causes (Daily)

<table>
<thead>
<tr>
<th>No</th>
<th>Causes</th>
<th>06.00-12.00</th>
<th>12.00-18.00</th>
<th>18.00-06.00</th>
<th>Remarks</th>
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<tr>
<td>1</td>
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<td></td>
</tr>
<tr>
<td>2</td>
<td>Haney seeker</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Coal makers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Campers</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>5</td>
<td>Farmers</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Others</td>
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<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
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</table>

16. Frequency of Fire Occurrences and the Causes (weekly)

<table>
<thead>
<tr>
<th>No</th>
<th>Causes</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
<th>Sunday</th>
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<tbody>
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<td></td>
</tr>
<tr>
<td>2</td>
<td>Haney seeker</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Coal makers</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Campers</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Farmers</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Others</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
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</table>
### 17. Frequency of Fire Occurrences and the Causes (monthly)

<table>
<thead>
<tr>
<th>No</th>
<th>Causes</th>
<th>January</th>
<th>February</th>
<th>March</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>Etc.</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Fisherman</td>
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<td></td>
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<td></td>
</tr>
<tr>
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<td>Haney seeker</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>Coal makers</td>
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<td>Campers</td>
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</tr>
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<td></td>
</tr>
<tr>
<td>6</td>
<td>Others</td>
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### 18. Appendix of Examination Report (and as evaluation of post fires)

<table>
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<tr>
<th>No</th>
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<tbody>
<tr>
<td>1</td>
<td>Responsible person</td>
</tr>
<tr>
<td>2</td>
<td>Institutions/Units</td>
</tr>
<tr>
<td>3</td>
<td>Locations</td>
</tr>
<tr>
<td>4</td>
<td>Function of the Areas</td>
</tr>
<tr>
<td>5</td>
<td>Dominant Vegetation</td>
</tr>
<tr>
<td>6</td>
<td>Total Areas of Fires</td>
</tr>
<tr>
<td>7</td>
<td>Information of Fires: Explain from who the information first obtained, when and who receive it.</td>
</tr>
<tr>
<td>8</td>
<td>Initial Attack: Explain what action taken after obtaining information, when to do and how many people involved.</td>
</tr>
<tr>
<td>9</td>
<td>Further action: Give simple explanation on:</td>
</tr>
<tr>
<td></td>
<td>• Transportation, communication and other facilities used to get assistance</td>
</tr>
<tr>
<td></td>
<td>• When to ask for help</td>
</tr>
<tr>
<td></td>
<td>• When do the assistance arrive</td>
</tr>
<tr>
<td></td>
<td>• Who involves</td>
</tr>
<tr>
<td>10</td>
<td>Methods:</td>
</tr>
<tr>
<td></td>
<td>• Did the operation conducted by one or more than one leaders?</td>
</tr>
<tr>
<td></td>
<td>• Was there any fire attack plan?</td>
</tr>
<tr>
<td></td>
<td>• Explain the steps of forest fire suppression, including fire breaks: the length, width, how long, the equipment, when, etc.</td>
</tr>
<tr>
<td></td>
<td>• Total number of personnel</td>
</tr>
<tr>
<td></td>
<td>• Was the operation well organized</td>
</tr>
<tr>
<td></td>
<td>• Others</td>
</tr>
<tr>
<td>11</td>
<td>Funding: Explain the cost and the sources of funding</td>
</tr>
<tr>
<td>12</td>
<td>Causes: Explain the possible causes</td>
</tr>
</tbody>
</table>
### 13. Environment situation
Explain physical condition of the forest before fires
- Understorey plants, bushes, shrubs, grass and their dryness levels
- Human activities near the location

### 14. Date of suppressed fires

### 15. Post fire activities
Explain the activities after fires
- Was there any patrolling?
- Did they do mopping-up?
- Was there any areas measurement?
- Were fire distribution and suppression activities mapped?

### 16. Attach sketch of location

### 19. Forest Fires

<table>
<thead>
<tr>
<th>No</th>
<th>Dates Start</th>
<th>Dates Finish</th>
<th>Location</th>
<th>Status of the area</th>
<th>Total area (Ha)</th>
<th>Dominant Vegetation</th>
<th>Causes</th>
<th>Suppression Efforts</th>
<th>Losses/damages</th>
</tr>
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<tbody>
<tr>
<td>(1)</td>
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### 20. Matrix of Case Status

<table>
<thead>
<tr>
<th>No</th>
<th>Types</th>
<th>Level/Process of Justice</th>
<th>Decision</th>
<th>Remarks</th>
</tr>
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<tbody>
<tr>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Level/Process of Justice</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
<tr>
<td>Research</td>
</tr>
<tr>
<td>Attorney</td>
</tr>
<tr>
<td>Court</td>
</tr>
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</table>

Decision
Remarks