

A study on forest fire at Bara District of the Nepal's Terai

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The present study on the occurrence and impact of forest fire was conducted at Bara District in the terai region of Nepal. Almost all forest fire in the study area were man made ground fire that caused a serious problem for the successful forest regeneration. About 90% of the regenerated commercial species of sal forest were damaged by fire, only five percent remained unaffected. Improper harvesting and utilization of forest products that leave behind a substantial amount of wood biomass such as dry leaves, branches, twigs and dry shrubs on the forest floor enhanced forest fire. About 85% of the total forest area (40,104.5 ha.) in Bara District is estimated to get forest fire annually. Estimated loss of sal (*Shorea robusta*) is 25,600 cft and the miscellaneous species is 5,96,009 cft per year. The total annual loss of products due to forest fire is estimated to be NRs. 2,53,16,000.00 according to the current market price.

Keywords : Forest fire, regeneration, forest products, shorea robusta, Bara District, Nepal.

Forest fire is one of the serious causes of forest destruction in Nepal. It is a rapid oxidation process which occurs at high temperature. It releases great amount of heat energy, carbondioxide and water vapors from the burning biomass as they are consumed.

Forests in the Terai region of Nepal are damaged annually by fire during the summer period. Although forest fire control and management is one of the components of forest management, very little has been done regarding forest fire management. Therefore, National Forest Division of the Department of Forests took initiative in 1996 to prepare forest fire control and management plan for the five districts in the terai (viz. Nawalparasi, Bara, Rautahat, Morang and Sunsari). This paper is an outcome of a field study (April to July 1996) done by a team of experts from the Glory Foundation (Glory) and Consolidated Management Services Nepal, Pvt. Ltd. (CMS), which were preparing the forest fire control and management plan for Bara District.

Methods

The study was conducted in the forests at Bara Districts of the terai. With the help of District Forest Officer (DFO) Assistant Forest Officers (AFOs), and Rangers of Bara District Forest Office key informants were used to collect information on forest fire, fire sensitive areas and the extent of fire damage and losses in the area. The experiences of inhabitants living adjacent to forests, were also collected through Focus Group Discussion. The fire sensitive areas were also observed to estimate social, economical and ecological impacts of forest fire.

To study the impacts of forest fire on soil, soil samples were collected from the fire sensitive areas and the similar forests where there was no fire at least for the last three years in Bara District Forests.

Results and discussion

Forest fire at Bara District starts from March and continues up to the end of May. April and

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May are the most hazardous months. The frequency of forest fire ranges from once a year to thrice a year within a single block of forest. Fire is common mostly in sal forests. It occurs up to twice a year. Burning within a place continues for half an hour to a few days once it catches stumps and dead trees. The extent of damage depends upon the amount of burning material i.e., accumulation of leaf litters and shrubs and the velocity of wind. The velocity of westerly wind is high after 12 noon. Also it is dry and causes serious damage as it enhances rapid expansion of forest fire. In the Siwalik areas, the wind generally blows from south to north (bottom to top) and the movement of forest fire also follows the same direction. It moves very fast during the day and damages the tree branches as high as 8ft from the ground. When the direction of fire is against the wind, the flame does not go up and hence it damages the vegetation at the forest floor.

Causes of forest fire

The present study indicated the following factors (almost all of them are man made) responsible for forest fire. .

- i) Forest fire set intentionally by the herdsmen and grass collectors in anticipation of new shoots of grass.

There is a traditional belief among the local people that the new shoots of grass are very palatable and highly nutritious. These shoots provide more strength for the ox used for ploughing. Milking cows and buffaloes produce more milk with high fat content. Traditional practice of grazing and keeping livestock within the forest (*Goth rakhne*) to feed new shoots (*Dadelo*) is still common in some forest areas at the study sites. The major grass species which produce palatable shoot is Siru grass (*Imperata cylindrica*), which sprouts profusely after burning.

- ii) Poachers set forest fire intentionally :

- to trap wild animals within a fire circle and compel them to get out from a single outlet, thus making hunting easy and secure
- animal become easily visible after forest fire

- absence of leaf litters on the forest floor does not distract wild animals from the sound of feet movement, and makes the poachers easier to reach closer to the prey
- foot prints of wild animals could be observed easily

- iii) Fuelwood collectors set forest fire in the pole and sapling stage to collect such wood after few days as if they are already dead and no forestry staff could object them.

- iv) Adjoining forest areas were burnt to protect their houses from accidental forest fire.

- v) Unintentional forest fire occurred from carelessly throughing the burning match stick or cigarette butts

- vi) Children set fire for entertainment or even innocently

- vii) Leaving improperly extinguished fire by charcoal makers

- viii) Throwing of burning tire pieces used as a torch while travelling in the forest at night

- ix) Fire remained after the collection of honey

- x) Fire set intentionally to make easy the collection of Sal (*Shorea robusta*) seed, Kurilo (*Asparagus recemosus*), Niguro (*Diplazium stolicrkae*) and some mushrooms

- xi) Fire set intentionally by the herdsmen to kill snakes, scorpions, etc.

- xii) Fire remained after campfire, picnic, etc.

- xiii) Shifting cultivation mostly around ward No. 4 of Ratanpuri Village Development Committee as a reason of forest fire

- xiv) Fire set intentionally to burn the forest vegetation for agricultural expansion.

The sal forests were more sensitive to fire damage followed by Terai hard-wood. This is due to the accumulation of leaf litters as the

trees shed leaves on the dry season which is more prone to fire.

Impacts of forest fire

Economic impacts

The loss on forests' capacity to regenerate is a serious impact of forest fire. The study team found that 90% of the regenerated commercial species of sal forest were damaged by fire. About 5 percent of these seedlings were also subjected to partial damage. Only 5 percent of the commercial species remained unaffected.

Very few dead or fallen branches in the forests around the settlement area were seen burnt as most of them had already been collected by the people living near the forest whereas almost all dead branches burn during the forest fire in forests far from settlements near to the Churiya hills. Dry and fallen trees of Asna (*Terminalia tomentosa*) were highly fire sensitive.

About 85% (40,104.5 ha) of the total forest area in Bara District is estimated to get forest fire annually. Assessment of the economic impact of forest fire in five sample forest blocks through rapid appraisal, indicated that 2.13cft/ha. of saw log by volume was lost, whereas 0.63 cft/ha of sawlog was partially damaged by fire. The total loss of sawlog is about 85,200 cft. Estimated loss of sal is 25,600 cft and the miscellaneous species is 5,96,009 cft per year. The annual loss of the fuelwood was estimated about 80 chatta*. The partial burning converted 25,065 cft of sawlog converted to 83.5 chatta of fuelwood. The total annual loss of products due to forest fire is estimated as NRs. 2,53,16,000.00 according to market price and NRs. 17,316,500 according to Government fixed stumpage price (Royalty). The calculation is based on the following assumption:

Forest Products	Market Price (NRs)	Royalty (NRs)
Fuelwood	8000/ chatta	1000/chatta
Sal sawlog	350/ cft	200/cft
Miscellaneous sawlog	100/ cft	170/cft

*1 chatta of fuelwood = 7500 Kg
one cft of wood = 25 Kg

Forest fire has significant impacts on non-wood forest products such as leaves of sal, bhorla (*Bauhinia valhi*) and tendupatta (*Diospyrus melanoxylon*) and thatch grasses which are used for both household consumption and commercial purposes. Also the shoots of the fodder trees become non palatable to the cattles due to smoke.

Social impacts

After the high intensity forest fire, saplings turn like dead branches which favors the collection of firewood for fuelwood collectors. There is a high demand of such round fuelwood (Dola Daura) in comparison to the axed firewood (Chirpat) in the local restaurants and tea shops because it burns slowly and produces high intensity heat. For such reasons the collectors intentionally set forest fire on forest areas.

Immediately after the forest fire, the green shoots and fodder become easily available. Grazing becomes very easy because of the growth of new shoots. Also some minor forest products like sal seed, niguro (a species of edible fern, mushroom, curilo (*Asparagus racemosus*)) can be easily collected. A traditional belief among the people that the forest fire kills snake, scorpion and many agricultural pests and pathogens also promotes forest fire.

The major destruction caused by forest fire in areas adjacent to villages, is the huge losses of property and life. Such fire also causes the movement of dry air with smokes which affect the health of people through several pollutant gases.

Impact on forest soil

Forest fire plays a significant role in the soil structure and texture. The report on soil analysis showed that pH, organic matter content and percentage of nitrogen, phosphorus and potassium were higher in samples of fire sensitive areas than other places (see table 1).

Soil analysis was carried out in June 1996 in the soil laboratory at Nepal Agriculture Research Council

The effect of change in the physico-chemical characteristics of soil needs to be researched in future.

Reference

Glory Foundation 1996. Forest Fire Control and Management Plan for Bara District. Final report.

Table 1: Physico-chemical properties of soil at the site of forest fire

Physicochemical properties of soil (0-20 cm)	Burnt area	Unburnt area
pH	5.7	5.5
Organic matter content (percentage)	2.8	1.5
Nitrogen (percentage)	0.09	0.04
Available phosphorus (Kg/ha)	121.4	116.4
Available Potash (Kg/ha)	274	192
Sand (percentage)	25	43
Silt (percentage)	60	48
Clay (percentage)	15	9
Organic carbon (percentage)	3.5	1.66