
J.G. Goldammer (Ed.)

Fire in the Tropical Biota

Ecosystem Processes and Global
Challenges

With 116 Figures



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1 Fire in Tropical Ecosystems and Global Environmental Change: An Introduction

D. MUELLER-DOMBOIS¹ and J.G. GOLDAMMER²

1.1 Introduction

Fire has always been an important ecological stress factor in the seasonal tropics. The dry deciduous forest and the savanna grasslands, in general, have evolved with fire. The plant life forms of these tropical biomes can cope with fire through various adaptive traits (Budowski 1966).

No such categorical statement can be made about the humid or wet tropics. Under the present climatic conditions, fire plays a less important role in the year-round wet biome of the undisturbed equatorial rain forest. The permanently warm temperature, in combination with the continuously high atmospheric and soil moisture levels, has created a natural greenhouse climate which encourages high rates of decomposition. Sudden accumulations of organic waste on the forest floor can occur, but they are usually spotty, noncontinuous, and transient. Such accumulations are brought about by certain rain forest trees that drop their foliage during flowering and fruiting or through trees that break down and create tree-fall gaps. For this reason, fire, which could start naturally from lightning, has only a small chance of gaining access into primary rain forest.

There are, however, exceptions related to climatic oscillations and to larger-scale disturbances. Recent investigations have shown that climatic changes between the Pleistocene and today have created drought conditions that have favored the spread of forest fires in long-return intervals (Sanford et al. 1985; Uhl et al. 1988; Goldammer and Seibert 1989 this Vol.).

Certain rain forests, particularly in the subequatorial tropics (from 10 to 23° latitude), are frequently subject to hurricane damage. Such broader-area damage promotes the invasion of vines, which can contribute to foliar biomass accumulation on the soil surface in forest openings, particularly during occasional dry spells. Also some extreme soils, those with imbalanced nutrients and toxic elements, can slow or stall decomposer activity and thereby permit accumulation of spatially continuous fuel loadings that can lead to fires in tropical rain forests.

The spread of frequent fires into the wet tropics is a more recent development, attributable largely to human population pressures. During the last two decades, the use of fire has dramatically increased with the rapid

¹ Department of Botany, University of Hawaii at Manoa, Honolulu, Hawaii 96822, USA

² Department of Forestry, University of Freiburg, 7800 Freiburg, FRG