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Fire as a land management tool in remote Eastern Himalayan valleys – socio-economic objectives and ecological constraints

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Fire is a natural disturbance agent in the Chir Pine forests of the inner dry valleys of the Eastern Himalayas. Human application of fire as a land management tool has masked disturbances and shaped ecosystems to the extent that natural disturbance regimes are difficult to discern. In an effort to conserve forests, fires were declared a prohibited practice in Bhutan for over 40 years until recently. Nevertheless, farmers have been routinely prescribing fires to induce the growth of fresh shoots of East Indian Lemon Grass, which is locally distilled for its high essential oil content.

We demonstrate the importance of Lemon Grass distillation for the local economy and present experimental results of a long term study demonstrating ecological effects of various fire regimes, defined by a factorial combination of different fire frequencies and intensities. Accordingly, repeated fires decrease Lemon Grass biomass, but increase its essential oil content, effectively rendering distillation worthwhile. Fire affects forest dynamics only under open stand conditions where it leads to increased Chir Pine regeneration. Repeated fires, however, kill a large proportion of seedlings and saplings, leaving trees unaffected. Under open conditions, fire strongly promotes Christmas bush, an invasive plant competing with Lemon Grass.

Results indicate possible prescribed burning regimes as an optimal compromise between socio-economic and forest management objectives, as well as ecological sustainability. The results presented formed the scientific basis for legalizing prescribed burning as a land management tool in Bhutan.