

ON FIRE

**Can wildlife and slash-and-burn
agriculture coexist?**

By T.R. Shankar Raman

The heat from the fire is intense, even from 300 feet. The entire slope is ablaze. Piles of slashed vegetation and tens of thousands of bamboo culms that had sun-dried for three months burn ferociously. The bamboo hisses, crackles, and explodes, audible a mile away. Hot gusts of wind scud the fire upslope, throwing branches and small trees 30 feet in the air. High above, unmindful of the billowing fumes, swallows and drongos frenziedly snatch up insects. Ash and smoke darken the sky, reducing the sun to a dull orange ball. In 20 minutes, almost as rapidly as it started, the fiery spectacle ends. Only smoldering ash and tree trunks remain.



The fire was kindled by tribal farmers of Teirei, a remote village adjoining tropical rain forest in the Lushai hills of Mizoram State in northeastern India. The farmers practice traditional slash-and-burn shifting agriculture locally known as *jhum* or *law* (pronounced lo). Ash is an effective way to enrich the poor soils with nutrients. The burned patch, however, is just within the border of the 200-square-mile Dampa Tiger Reserve, established in 1989 to protect tigers, hoolock gibbons, capped langurs, clouded leopards, hornbills, great slaty woodpeckers, wren-babblers, and other endangered species.

Jhum is a serious conservation issue. Between 1989 and 1995, remote-sensing analyses estimated that the practice destroyed more than 385 square miles of forests in seven northeastern states. The effects on wildlife are largely unknown because few studies have been done in these often remote, insurgency-ridden parts of India. On the other hand, more than a hundred ethnic communities and well over a quarter of a million families depend upon jhum for their livelihood and economy, frequently cultivating in or at the edge of protected areas.

Many conservationists claim that, by destroying forest cover, jhum causes wildlife declines and extinctions, soil erosion, and drastic environmental changes—evident when tall, primary rain forest is replaced by crop fields. Others have argued that the effects of jhum may be relatively benign compared to those of terrace cultivation, tea plantations, and monoculture forestry. By maintaining a mosaic of fallows and regenerating forest, jhum may help increase biological diversity at the landscape level. Yet, the critical question is: Do species of high conservation value—those that are rare, specialized, and/or have small ranges—benefit or suffer from slash-and-burn cultivation?

Although timing of cultivation, types of crops, and agricultural practices of jhum vary in Indian communities, the broad pattern is remarkably similar to slash-and-burn cultivation in southeast Asia and other tropical regions. Until recent times, the enterprise in northeast India has been driven and regulated by the community that controls the land. Each household is allotted a parcel of land between 2.5 and 10 acres in size. Normally, this would be part of a slope of secondary forest that has been regenerating for five to ten

years since the previous cultivation. Tall, mature rain forest is also cleared, but rarely, owing to the scarcity of such forest and the difficulties of clearing.

After the land is cut, in January or February, the slash dries on the hills until April, when it is burned just before the onset of pre-monsoon rains. Farmers then sow several varieties of rice, their mainstay, along with more than a dozen other crops, including eggplants, beans, and tubers, as well as some cash crops such as tobacco and chili peppers. Weeding and multiple harvests last until October, when the spent field is abandoned. Fields are rarely cultivated in successive years, because one round of cultivation severely depletes the soil. The next year, new areas are cleared, and the process is repeated until the vegetation in the first site regenerates sufficiently to permit cultivation again—usually within ten years. But can native plants and wildlife recover after slash-and-burn?

To observe a regenerating forest from the time it is cleared to when the vegetation or a semblance of it recovers is practically impossible within the lifetime of a rain-forest biologist. So, to study changes in vegetation and wildlife in Dampa, I surveyed sites that had regenerated for between one and 100 years and compared them to rain forest that had never been cleared.

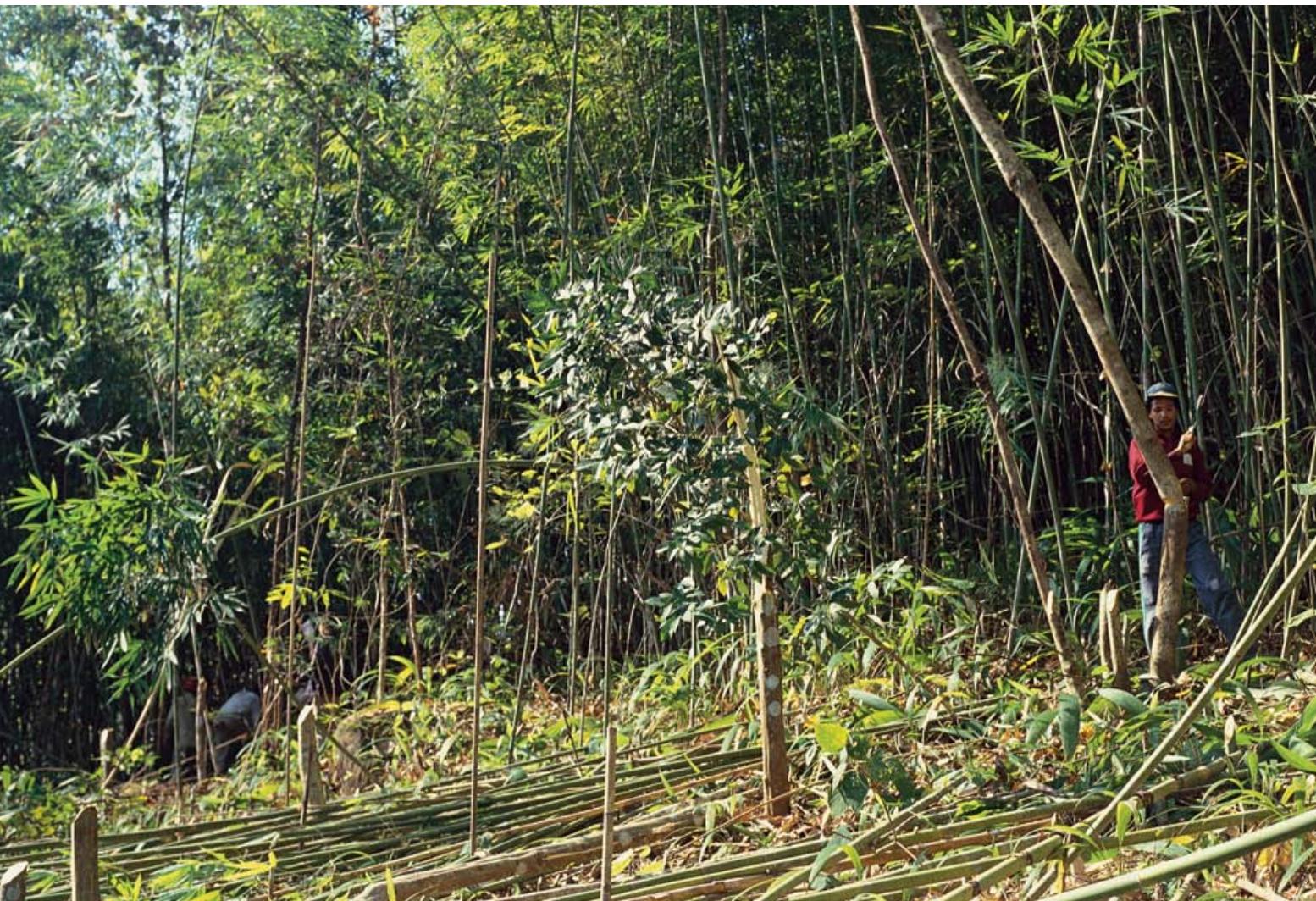
Soon after a field is abandoned, weeds, grasses, surviving crop plants, and bamboos sprouting from underground rhizomes run amok, creating a dense and vigorous tangle that at first threatens to smother forest regeneration. In open fields with hardly any canopy, common and widespread wildlife proliferates. The ubiquitous tailorbird, red-vented bulbul, and gray bushchat thrive in open land that has lain fallow for one year. Most rain-forest species avoid

these areas, although the occasional pigeon or woodpecker may briefly visit an isolated tree standing dry and forlorn in the field. The common hoary-bellied squirrel scurries on the ground, picking at choice bits of food. The grass looks good for ungulates, but the shy barking deer and sambar seldom venture here, for they may be snared or shot.

Fortunately, this situation does not last long. The open, weedy fallows rapidly give way to bamboo forests. In five years, the bamboo, along with pioneer trees such as *Maca-ranga* and *Trema*, form dense stands that reach ten feet and higher. Wildlife from the surrounding landscape begins to colonize. Understory birds are among the first to appear in sizable numbers: rain-forest babblers, warblers, flycatchers, and bulbuls.

Bamboos reign supreme for many years. In Mizoram, the bamboo *Melocanna bambusoides* dominates regenerating fallows for at least the first 30 years. As time passes, more bird species appear, and the air is alive with their calls. Some arboreal mammals venture into tall bamboo and secondary forests that have been allowed to regenerate for ten years or more, particularly if they are near mature rain forests. Phayre's leaf-monkey, the white circles around its eyes giving it a permanent expression of amazement, forages in troops of a dozen or so individuals in the canopy, usually nibbling only at the leaf petiole and discarding the rest. The sprightly, dark-furred and red-bellied Pallas's squirrel, and even a few of the cautious black-and-white Malayan giant squirrel scamper through the canopy or pause to gaze suspiciously at observers. As bamboos and pioneer trees grow taller and larger, rain-forest tree seedlings sprout and flourish in their shade.

If left undisturbed, the slow-growing saplings eventually



S. U. SARAWAKUMAR, T. R. SHANKAR RAMAN (OPPOSITE)

In northeastern India, millions of poor farmers depend on slash-and-burn shifting agriculture, locally known as *jhum*, for their livelihoods (page 47, a *jhum* fire speeds upslope in Dampa Tiger Reserve in Mizoram State). Opposite: A farmer in the remote village of Teirei clears his *jhum* field, cutting bamboo and pioneer trees in a secondary forest that has regenerated on land that was cultivated and then abandoned ten years earlier. When mature rain forest is cleared, as occasionally happens, all vegetation including tall, mature trees are cut (left), to the detriment of species dependent on undisturbed habitat.



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take over after the bamboos flower en masse and die. One site, that had regenerated for 100 years, contained mostly tall rain-forest trees and lianas with little trace of bamboo. Here, and even more so in primary rain forest that has never been cleared, plants and animals achieve their highest diversity.

While camping in a cave by the Tuichar River, deep in primary rain forest, I saw four species of primates including a family of hoolock gibbons; five species of squirrels; three species of green pigeons in large flocks; great, oriental pied, and wreathed hornbills; imperial pigeons; Asian fairy bluebirds; and, surprisingly, even a flock of laughing thrushes in a single day at a fruiting wild fig tree. In stark contrast, fig trees that were left standing alone and tall above a jhum fallow or a bamboo forest held only a vestige of these spectacular gatherings, fewer species, and mostly common ones.

When regenerating bamboo forests are cleared for cultivation within ten years, as usually happens in northeast India, rain-forest recovery is interrupted and the land undergoes another of the endless cycles of bamboo. Due to the spread of shifting cultivation in the region, which means short fallow cycles of fewer than ten years, huge areas are under this “arrested succession” of dense, almost monotypic bamboo forests. Besides having fewer species, these bamboo forests are also prone to destructive fires after bamboos flower en masse and dry up. Nearly 40 years after the last bamboo flowering during the late 1960s, vast areas of Mizoram are in the midst of a spectacular flowering.

India’s only ape, the hoolock gibbon, and other arboreal mammals such as the capped langur and the Malayan giant squirrel, occur only in mature rain forest and are locally extinct or very rare in jhum-altered landscape. The number of bird species increases with forest regeneration, rapidly at first, then slowly to reach maximum diversity and abundance in the 100-year-old mature forest and undisturbed tropical rain forest.

But what about the traditional rights of indigenous people? Social activists have justifiably championed them. Yet, defining what is traditional and who is indigenous in communities undergoing rapid socioeconomic changes, market integration, and migration is difficult. In and around Dampa Tiger Reserve, as in other parts of northeast India, the human population has soared in recent years and includes many settlers from other parts of Mizoram, Tripura, Nepal, and Bangladesh, all with their own customs and traditions, and far removed from places where their traditions initially evolved. Indeed, a large number of people in Mizoram have converted from animism to Christianity.



Many common species, such as the gray bush chat (left), make use of open, fallow fields abandoned after jhum. The Assamese macaque (above) sometimes enters the vicinity of old fields, looking for food on the ground to eat. The leaf-eating capped langur (opposite, top) prefers undisturbed rain-forest canopy habitat.



Jhum is not the only problem for wildlife conservation here. Large-scale logging by the government, illegal timber poaching, and conversion of rain forests to monoculture plantations of tea and teak—widespread ecological ills caused by state and private, mostly non-tribal, interests—consume precious land and forest. As a consequence, the burgeoning tribal populations, growing at among the fastest rates within India, are forced to clear remnant forest tracts and to cultivate at shorter fallow periods. And so, the vicious cycle of arrested bamboo succession continues. If wildlife conservation in India’s northeast is to be effective, all the forces of landscape change must be addressed, squarely and urgently.

Although it is easy to say that from a biological perspective one needs undisturbed, preferably large tropical rain forests, it is not an easy conservation objective to achieve. Such areas are scarce, and one is often left with only various-sized, disturbed fragments of rain forest in a jhum-dominated landscape.

There are alternatives. In Meghalaya, tribal communities protect small, sacred groves. In Mizoram, thanks to state laws passed in the 1960s, villagers use a network of “supply” forests under regulated use for biomass harvests. More infrequently, a few “safety” forests exist, fringes around villages created to protect them from jhum fires. These areas are rapidly diminishing or vanishing as villages grow and lifestyles change.

Conservation efforts in northeast India cannot proceed without due consideration of the legitimate needs of the millions of poor farmers, who depend on jhum for their liveli-

hoods. Shifting cultivation is an organic system of multiple cropping well adapted to areas of high rainfall. Alteration of jhum to mechanized or terraced agriculture or monoculture plantations, even if possible, may be even worse for biological diversity. In parts of northeast India, intense, short-cycle jhum and wildlife conservation are largely incompatible. In the ultimate reckoning, only strictly protected primary rain forest will be successful.

In Dampa Tiger Reserve, conservation efforts have been promising. After initial difficulties, 11 villages with nearly 500 families located inside the sanctuary were resettled on the periphery in 1989. Today, jhum is mainly restricted to the buffer zone and areas outside sanctuary boundaries. A large project implemented through the local government and village councils is underway to develop and sustain alternate livelihoods for the villagers, with the goal of minimizing pressures on Dampa’s forests.

Meanwhile, scientific surveys continue to reveal the extraordinary diversity in these rain forests. Using camera-traps, forest staff obtained photographs of the rare and elusive marbled cat and the clouded leopard. A survey to catalogue resident reptiles and amphibians has revealed the presence of several rare and endemic species, including some that could be new to science. In many ways, Dampa represents a tantalizing pocket of hope for what is possible in these remarkable rain forests.

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