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Research article

# Impact of lopping on tree species of tropical Indian forests

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**Abstract:** The study was carried out in Hojai reserve forest of Nagaon district of Assam, a good example of tropical moist deciduous forest of Northeast India. For this study fifty 10×10 m size quadrates were laid down and recorded the number and girth size of cut stumps within the quadrates. Cut stump of *Syzygium cumini*, *Shorea robusta*, *Holarrhena antidysenterica*, *Trewia nudiflora*, *Terminalia belerica*, *Cassia fistula*, *Lagerstroemia parviflora*, *Lagerstroemia flosreginae*, *Careya arborea*, *Dillenia scabrella*, *Zizyphus jujuba* and *Pterospermum acerifolium* were recorded from the study site. Among these 12 largely exploited tree species highest cut stumps were found in *Syzygium cumini* (26%) and *Shorea robusta* (19%). Both the species can use as a timber and other purpose. The highest cut stump was recorded in 10–30 cm girth class. It indicates that the species were exploiting not only for the timber but also for firewood and some other household purpose.
**Keywords:** Trees - Anthropogenic disturbances - Cut stump - Regeneration.

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## INTRODUCTION

In India protected area includes national park, animal sanctuary, biosphere reserve, reserve forest etc designated by IUCN. In reserve forest rights to activities like hunting and grazing allow to communities living on the fringes of forests who partially or wholly depend upon the forest resources or products for their livelihood unlike national park or biosphere reserve. Reserved forests have their own "Conservation values" (derived from species richness, floristic and faunal endemism, and uniqueness of ecosystem), sometimes that are equivalent to or higher than the areas designated as National Parks and Sanctuaries (Ramesh *et al.* 1997). In India, habitat destruction, over exploitation, environmental pollution and anthropogenic pressure are the major disturbances to forest ecosystems. Disturbance induced by human being differ with response to the people inhabitant in and around the protected areas and their livelihood status and economic conditions. The conservation of biodiversity and human use of tropical forest resources in developing countries are in conflict with each other (Singh 1998). It is important to see how natural communities in forest stand and their structural attributes are affected by anthropogenic disturbances (Mishra *et al.* 2004). The degree of disturbance were quantify from lopping status by many worker (Kanzaki & Kyoji 1986, Rao *et al.* 1990, Pandey & Shukla 2003).

The objective of the present study is to find out the highly exploited tree species through lopping and their natural regeneration status.

## MATERIAL AND METHODS

*Study area*

The study was conducted in tropical forest of Assam namely Hojai Reserve Forest (HRF) situated within the Hojai sub-division, towards the South of Nagaon district of Assam, India. The Hojai Reserve Forest is situated between the geographical limit of longitude 92º49'30"–92º53'0" E and latitude 25º55'0"–25º58'0" N (Fig. 1). The area of this forest is 948 ha at an elevation of 76 m above msl. Topography of Hojai Reserve Forest is flat ground. The forest is surrounded with settlement except the southeast corner. There is one forest village (Kurkut) and one taungya village (Nandapur) located in and around the Hojai Reserve Forest. The forest is being affected by firewood collection, artificial forest fire and grazing. Champion & Seth (1968) classified Hojai


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Reserve Forest as a Kamrup sal forest ($_3C/C_2d(iv)$) under the tropical moist deciduous type of forest. The dominated tree species of the forest is *Shorea robusta*. Along with *Shorea robusta*, species of *Albizia* and *Lagerstroemia* covers the top canopy of the forest.

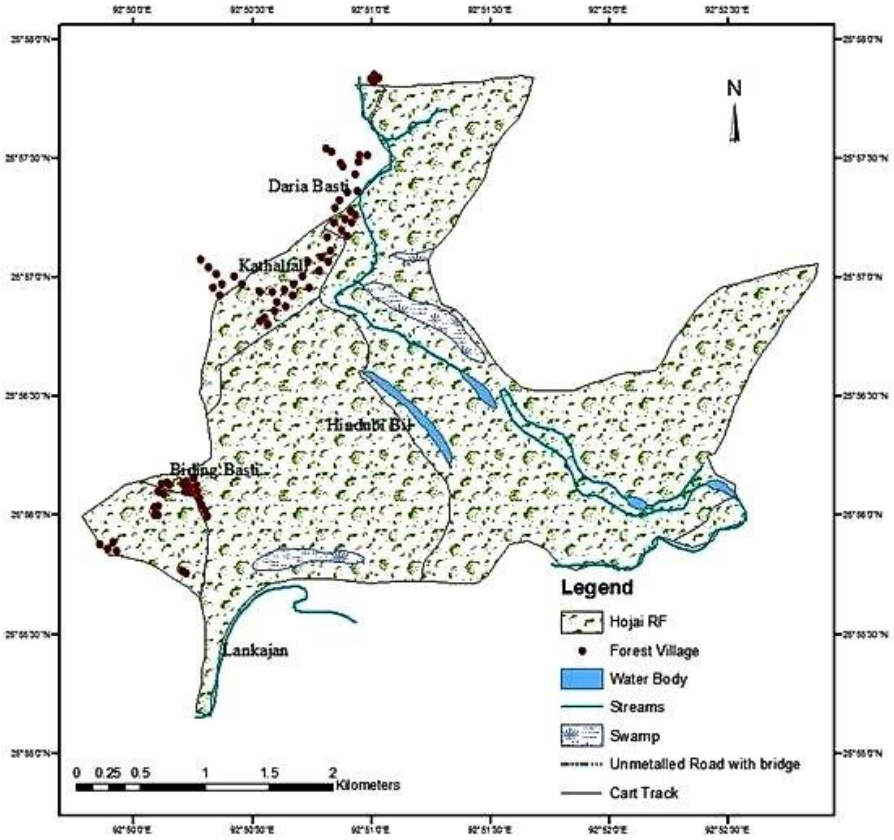


**Figure 1.** Map of Hojai reserve forest, Assam, India.

*Sampling*

The study was carried out during 2009–2010. Fifty quadrates of 10×10 m size were laid down in study site. Tree individuals and cut stumps encountered within the studied quadrat were counted and girth sizes were recorded during the sampling. Girth of tree individuals were measured at 1.3 m height from the ground surface. Depending on height of cut stumps, girth of cut stumps was measured above the ground surface or at 1.3 m.

Girth ≥30 cm of tree individuals were considered as an adult, <30 to >10 cm were considered as a sapling and ≤10 cm at the base were considered as a seedling. The regeneration status of exploited species was determined based on population size of seedlings, saplings and adults (modified from Khan 1987, Shankar 2001, Khumbongmayum *et al.* 2006). Thereby the forest was considered to be in good regenerating state, if seedling > sapling > adults; fairly regenerating state, if seedlings > or ≤ saplings ≤ adults or seedling ≤sapling > adult; poorly regenerating state, if the species survives only in sapling stage, but no seedlings (saplings may be <, > or = adults). If a species present only in adult form, it was considered as not regenerating species. Species considered as newly regenerating if the species had no adults but present only in seedlings or saplings stage.

## RESULTS

Cut stump of *Syzygium cumini* (26%), *Shorea robusta* (19%), *Holarrhena antidysenterica* (13%), *Trewia nudiflora* (10%), *Terminalia belerica* (7%), *Cassia fistula* (7%), *Lagerstroemia parviflora* (3%), *Lagerstroemia flosreginae* (3%), *Careya arborea* (3%), *Dillenia scabrella* (3%), *Zizyphus jujuba* (3%) and *Pterospermum acerifolium* (3%) were recorded (Fig. 2). In the study sites sapling and adult tree species was the main targeted individual for exploitation. The maximum cut stumps were recorded in adult stage compared with the seedling and sapling stage. The highest cut stumps was recorded (12 cut stumps $ha^{-1}$) for *Syzygium cumini* in sapling stage followed by *Shorea robusta* (10 cut stumps $ha^{-1}$) in adult stage (Table 1).


**Figure 2.** Photographs showing cut stumps in the study site.

**Table 1.** Tree species showing living individual density and cut stump density in each seedling, sapling and adult stage.

| S.N. | Species | Seedling ($ha^{-1}$) | | Sapling ($ha^{-1}$) | | Adult ($ha^{-1}$) | |
|---|---|---|---|---|---|---|---|
| | | Living individuals | Cut stumps | Living individuals | Cut stumps | Living individuals | Cut stumps |
| 1. | *Syzygium cumini* | 142 | 0 | 38 | 12 | 4 | 4 |
| 2. | *Shorea robusta* | 3396 | 0 | 384 | 2 | 164 | 10 |
| 3. | *Holarrhena antidysenterica* | 1058 | 0 | 22 | 6 | 2 | 2 |
| 4. | *Trewia nudiflora* | 8 | 8 | 2 | 0 | 0 | 6 |
| 5. | *Terminalia belerica* | 54 | 0 | 2 | 0 | 4 | 4 |
| 6. | *Cassia fistula* | 66 | 0 | 10 | 2 | 2 | 2 |
| 7. | *Lagerstroemia parviflora* | 278 | 0 | 6 | 0 | 2 | 2 |
| 8. | *Lagerstroemia flosreginae* | 206 | 0 | 8 | 0 | 4 | 2 |
| 9. | *Careya arborea* | 454 | 0 | 30 | 0 | 12 | 2 |
| 10. | *Dillenia scabrella* | 72 | 0 | 8 | 0 | 0 | 2 |
| 11. | *Zizyphus jujuba* | 230 | 0 | 20 | 2 | 0 | 0 |
| 12. | *Pterospermum acerifolium* | 88 | 0 | 6 | 0 | 0 | 2 |

Except *Terminalia belerica* other exploited species like *Syzygium cumini, Shorea robusta, Holarrhena antidysenterica, Trewia nudiflora, Cassia fistula, Lagerstroemia parviflora, Lagerstroemia flosreginae, Careya arborea, Dillenia scabrella, Zizyphus jujuba* and *Pterospermum acerifolium* were recorded in good regenerating condition in natural habitat. *Terminalia belerica* was recorded in fairly regenerating condition.

## DISCUSSION

Presence of cut stumps indicate the larger intervention of local people to meet various purposes of their requirements such as for timber, medicine, food, fodder, fuel wood, building material, etc and as a result of which the Hojai reserve forest is under the threat of lopping, a major anthropogenic pressure (Dutta & Devi 2013). Among the lopped species *Syzygium cumini, Zizyphus jujuba* are fruit yielding plant. *Holarrhena antidysenterica, Terminalia belerica* have some medicinal property and *Holarrhena antidysenterica* is considered as a good drug for the diarrhoea by the local inhabitants. *Shorea robusta* is a good timber yielding plant, so the government attempted to manage sal forest for commercial timber production in order to increase revenue (Gautam & Devoe 2006). Because of the commercial value, it is found as a second highest lopped species during the study followed by *Syzygium cumini*. *Syzygium cumini* preferred as a fodder by local people might one of the reasons for heavy lopping of this species was also observed by Pradhan *et al.* (2007) and Sapkota *et al.* (2009). Adult tree individuals are the main target for illegal lopping. Illegal lopping is considered as one of the major disturbance factor in forest stand and is associated with saplings and adult tree individuals (Sapkota *et al.* 2009).

All the lopped species may tolerate the disturbances, so the natural regeneration of these species took place adequately but affects the density of tree individuals. Felling of tree also create a gap inside the forest create

suitable microsites for species, which may be another reason for highest number of seedling density in the study sites. The combined effect of increased light intensity, increased soil temperature, and reduced competition increases seedling recruitment and establishment in canopy gaps compared to closed canopies (Sapkota *et al*. 2009).

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