

**THE LONG-TERM IMPACTS OF LOGGING ON BIODIVERSITY OF PLANTS  
AND SOIL CHARACTERISTICS OF A TROPICAL RAIN FOREST: A CASE  
STUDY OF SOME COMPARTMENTS OF ATEWA FOREST RESERVE**

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**ABSTRACT**

This project investigated the long-term impact of logging 15 years ago on the biodiversity of plants and some soil characteristics in the Atewa Forest Reserve, Ghana. The study took place in the logged portions of the concessions of Timber and Transport near Akwadum and Wansima Timbers near Sagyimasi and their corresponding unlogged portions of the Atewa Forest Reserve in the Eastern Region of Ghana.

The study comprised (i) a Focus Group Discussion at Akwadum, (ii) a deliberate floral inventory involving ten 20m x 20m sample plots each in the logged portion of the two timber concessions: Timber and Transport (TAT) Concession and the Wansima Timber Concession as well as their corresponding unlogged portions and (iii) analysis of soil samples obtained from the TAT concession of the Atewa Forest Reserve. A meeting was held to have a group discussion with some members of the Akwadum community whose age ranged between 20 and 80 years. During the discussion, respondents were divided into six age classes: 20-29, 30-39, 40-49, 50-59, 60-69, 70-79 and questions were asked to elicit responses on issues relating to logging, benefits derived from the forest and forest conservation. A total of twenty sampling plots each with five randomly selected 1m<sup>2</sup> subplots were established; ten in the unlogged portion and the other ten in the logged portion of the TAT concession as well as the Wansima Timbers concession. All plant species were identified and enumerated in each plot, and the girth of each woody species was measured. Soil samples were taken from the five randomly selected 1m<sup>2</sup> subplots for analysis in the laboratory.

Results obtained indicated that out of 40 individuals, who participated in the focus group discussion, 22 were males and 18 were females mostly within the 30-39 years age category. The age class with the least representation was the 70-79 years old category. Thirty one (31) out of 40 participants were farmers, 7 were traders, whereas the remaining two were accomplished herbalists. Most people of Akwadum depend on non-timber forest products

(NTFPs) for their livelihood. Results of floral inventory in the TAT concession of the Atewa Forest Reserve indicated that in the long term logging did not lead to a significant reduction in the total number of plant species. There were 74 species encountered in the unlogged portion compared to 65 species in the logged portion. Thus, the forest repaired itself in terms of plant diversity. Nine plant species: *Antiaris Africana*, *Milicia excelsa*, *Pycnanthus angolensis*, *Cola gigantea*, *Holoptelea grandis*, *Hoslundia opposita*, *Phyllanthus amarus*, *Piper guineensis* and *Strephonema pseudocola* were found only in the unlogged portion but not in the logged portion. Similarly, results of floral inventory in the Wansima Timbers concession in the Atewa Forest Reserve indicated that in the long term logging did not lead to a significant reduction in the total number of plant species. 42 plant species were found in the unlogged portion compared to 36 in the logged portion. Fourteen species: *Ceiba pentandra*, *Milicia excelsa*, *Napoleonaea spp*, *Cussonia bancoensis*, *Drypetes chevalieri*, *Gliffornia simplicifolia*, *Glyphaea brevis*, *Trilepisium madagascariense*, *Lecanioidiscus cupanioides*, *Calamus spp*, *Raphia hookeri*, *Diospyros kamerunensis*, *Ochna ovate* and *Xylopia quintasii* were found only in the unlogged portion but not in the logged portion whereas 8 species: *Antiaris Africana*, *Khaya ivorensis*, *Daniellia ogea*, *Diospyros barteri*, *Musanga cecropioides*, *Corynanthe pachyceras*, *Ochna staudtii* and *Psydrax subcordata* were also found only in the logged portion but not in the unlogged portion.

*Celtis mildbraedii*, *Piptadeniatrum africanum*, *Nesogordonia papaverifera*, *Khaya ivorensis*, *Nauclea didirechii*, *Terminalia superba*, *Triplochiton scleroxylon*, *Pycnanthus angolensis* and *Ceiba pentandra* are species that are officially classified as timber by the Forestry Commission (FC) which were encountered in the two concessions of Atewa Forest Reserve. *Nesogordonia papaverifera* was the most frequent and abundant timber species in the Atewa Forest Reserve. The girth classes of timber species encountered in both the TAT and Wansima Timbers concessions were 0-5cm, 5-10cm, 10-15cm, 15-20cm, 20-25cm, 25-30cm, 30-35cm, 40-45cm, 50-55cm, 60-65cm, 75-80cm and 95-100cm, out of which the most frequently occurring girth class was 0-5cm. There were a significantly higher number of individuals of *Nesogordonia papaverifera* and *Celtis mildbraedii* plants in the girth class of 0-5cm within the unlogged portion compared to logged portion. *Piptadeniastrum africanum*, *Triplochiton scleroxylon*, *Nauclea didirechii*, *Ceiba pentandra*, *Khaya ivorensis* and *Milicia excelsa* appeared to be threatened and scarce in the Atewa Forest Reserve. In Atewa Forest Reserve, *Antiaris Africana* and *Milicia excelsa* which are used by the local community were present only in the unlogged portion of the TAT concession but absent from the logged portion. Logging had an adverse effect on medicinal plants biodiversity since *Cola gigantea*,

*Holoptelea grandis*, *Hoslundia opposita*, *Phyllanthus amarus*, *Piper guineensis* and *Strephonema pseudocola* were found only in the unlogged portion but not in the logged portion. Logging did not affect the presence of plant species of no known current use but are of ecological importance since the same number and types of species were found in both the unlogged and logged portions of both the TAT and the Wansima Timbers concessions. In the TAT concession, logging led to a reduction in the proportion of sand in the top soil, organic carbon content in both the top and sub soil, available phosphorus content in the top soil, calcium content in the sub soil and magnesium content in the top soil.

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