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## Sustainable Forest Management in Amazonia Based on Tree Ring Data

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### Abstract

Sustainable management of forest is in international discussion as one attempt to protect tropical forests ecosystems. Many criteria and indicators are developed for the certification of such systems. The key-indicator however is the wood increment of trees and of forest stands, its knowledge is poor. Estimates are vague and vary considerably in dependence of species, site and measurement method.

Growth rates and ages of tropical trees often give occasion to controversy discussions due to the assumed absence of annual tree rings. In fact the existence of annual rings in tropical trees under seasonal precipitation conditions is proven since the beginning of our century. The trigger for the annual growth period is either a periodical inundation as it occurs in the annually flooded areas of great streams or periodical dry periods of two or three months as they occur in most non flooded areas in the tropics, even close to the equator. The seasonal climate type with one distinct dry season is widely distributed in the humid tropics.

In a reserve at the middle Amazon close to the city of Téfé the Institute Mamirauá develops in co-operation with the local inhabitants management plans for sustainable use of the natural resources and concepts for the protection of rare animal and plant species. One important part is the plan for sustainable forest management. This includes the investigation of growth behavior of timber species by means of tree ring analysis. The modelled growth patterns show a high variation in radial, volume and biomass increment. The model indicates an optimal period for logging between the peaks of current and mean volume increment. The cutting cycle in the reserve is presently limited to 25 years for all species. Our results show that the cycles must be adapted specifically to avoid overexploitation of the slow growing and to allow economical use of faster growing species. The investigation can be used as a model for the estimation of sustainable wood growth in other tropical forest ecosystems.

**Keywords:** Sustainable forest management, tree rings