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“Development on the margin”

## Population Structure and Natural Regeneration of *Boswellia papyrifera* Hochst. in Dry Woodlands of Nuba Mountains, South Kordofan State, Sudan

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### Abstract

*Boswellia papyrifera* (Del.) Hochst. family *Burseraceae* is an important indigenous multipurpose tree species known for its diverse ecological and economic benefits. In economic terms frankincense or gum olibanum is its most valuable product which has a broad spectrum of applications in cultural uses and modern industries. Despite the potential and actual economic development and environmental conservation benefits of the species, its population and habitat is degrading. Adequate knowledge on the current status of its population is crucial for a sustainable management. The objectives of this study were (i) to analyse the population structure and density of *B. papyrifera*; (ii) to analyse the natural regeneration status of *B. papyrifera*, and (iii) to assess the impact of frankincense harvesting. The study was carried out in two woodlands in South Kordofan state, Sudan in 2008: Kajinat forest (preserved) and Tajmala forest. Random sampling was used for selection of sample plots of 20 m × 20 m size in Tajmala (12 sample plots) and Kajinat (21 sample plots) forests. Smaller sample plots of 5 m × 5 m size were nested in the centre of each plot for regeneration assessment. The results reveal that the population of *B. papyrifera* is unstable and occurs with low densities  $81 \pm 79$  trees ha<sup>-1</sup> and  $52 \pm 50$  trees ha<sup>-1</sup> in the preserved and not-preserved forest, respectively. The population structure in both stands looks inverted ‘J’ shaped depicting the low regeneration and recruitment of the species. In addition, all individuals encountered in the sample plots in both stands have diameter at breast height (DBH) greater than 11 cm indicating the lack of juvenile individuals and lack of recruitment. The results illustrate that there is a complete lack of regeneration and juvenile individuals in combination with high mortality, damages by insect and browsing. Moreover, 43 % of all individuals were observed severely over tapped at more than 15 tapping spots. We conclude that *B. papyrifera* stands are under threat and frankincense production is being done without a sustainable management plan and supervision. Proper management plan and domestication of the species through artificial regeneration and conservation through area closure are urgently needed.

**Keywords:** *Boswellia papyrifera*, density, dry woodlands, natural regeneration, population structure, tapping of frankincense