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There remains a lack of information on the future of plant species in many parts of Africa under the threads of climate change with the exception of the mountainous areas. Models are valuables tools to examine this problem because they permit to extrapolate basic information as simple as species occurrence coming from a restricted number of localities to the entire continent. Niche-based models, like logistic regression or MaxEnt, easily allow fitting empirical relationships between environmental variables related to climate and possibly to soil properties. They produce probabilities of occurrence for the present with good accuracy (calibration phase). Projections for the future are made by switching the explanatory data set with future conditions. These models however are limited by the fact that it is difficult to integrate physiological response to increasing CO2 air concentration.

Dynamic vegetation models (DVMs) are process-based models that simulate plant environment (soil water, light intensity at various heights, etc.) and plant physiology (transpiration, CO2 fixation, photosynthesis, respiration, carbon allocation, etc.) from climate variables, soil properties, and elevation. They could be run at various scales, from global to regional or even local scale, and simulate the growth of plant functional types (PFTs), of biological affinity groups (BAGs) or of species. A model like CARAIB is able to simulate PFTs and BAGs growth (occurrence and productivity) with rather good accuracy for Western Europe. For the future, the simulations confirm that the physiological effect of CO2 concentration change is dramatic but not easily foreseeable because it depends on overall fertility of the sites (Dury et al., iForest – Biogeosciences and Forestry, 4:82-99, 2011). From this conclusion, spatial and temporal variations of fertility would have to be introduced in modelling studies to reach more operational conclusions.

Questions arising about the future of ecosystem services in tropical countries highlight particular plant species (BIOSERF project funded by the Belgian Science Policy: Sustainability of tropical forest biodiversity and services under climate and human pressure). In this study, we model a set of 11 selected African tree species including several Congolese species with logistic regression, MaxEnt and CARAIB models. The two niche-based-models rather properly simulate the ranges obtained with the alpha-hull polygon method. CARAIB correctly simulates the range of the evergreen species but not of the deciduous trees. We examine how physiological knowledge could be use to improve the model. IN particular, we conclude that bud dormancy breaking representation has to be upgraded in the model because this process is likely to control the range of the species. It should act in combination with the specific bioclimatic constants controlling the hydrological and thermal stress and the germination. Additionally, we examine the evolution of the ranges at the 2050 horizon using one of the most recent socio-economic scenarios.

128

MODELLING SEED DISPERSAL AND TROPICAL FOREST REGENERATION: AN APPLICATION TO STAUDTIA KAMERUNENSIS IN THE WWF LAKE TELE - LAKE TUMBA LANDSCAPE IN DR CONGO

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Unsustainable hunting and slash-and-burn farming in tropical forests can lead to the empty forest syndrome. It is characterized by the loss of key species essential in the maintenance and regeneration of the forest. Indeed the main mechanism of this regeneration is seed dispersal, which for tropical trees is usually driven by animals, and the alteration of this process through a reduction of the disperser population may have serious consequences on forest composition. Computer models are powerful tools to study these processes, not only towards a better understanding of the key mechanisms controlling tropical forest regeneration, but also with the aim of optimising forest management and exploitation to reach a better equilibrium between tropical tree species and their seed dispersers.

This study describes a seed dispersal module ultimately developed to analyze the regeneration of the rainforest in the WWF Lake Tele – Lake Tumba Landscape in RD Congo (BIOSERF project funded by Belgian Science Policy). The module has been developed to upgrade the CARAIB dynamic vegetation model, which is used in the BIOSERF project. Data are derived from a field study in which we analyzed seed dispersal of a common tree species (Staudtia kamerunensis) and we determined the community of its main dispersers (largely dominated by the hornbill Bycanistes albotibialis). Additional data (density of S. kamerunensis, habitat use and retention time in the digestive tract of hornbills to simulate dispersal kernel) were obtained from literature and satellite images. Different simulations were performed to represent seed rain over time and a survival rate was applied to show the regeneration. The module was able to provide a percentage of recolonization of degraded places. In the end, this result was compared to field studies, which provide close percentage of recolonization.

129

GENERAL SOLUTIONS FOR FORESTRY PROBLEMS IN AFRICA

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The forest resources in Africa have direct and indirect contributions to the environmental, economic and social welfare of Africans. Forests also contribute an important and irreplaceable role in the continent's environmental, social and economic development. If we properly managed and exploited them, they can protect climate change, soil, water catchments and wildlife beside to economic benefits. There are general solutions here in after for forestry problems in Africa:

1. Protecting Forest Resources

The life of millions of people in Africa depends on the rainforest found in different parts of the continent. The African Union Commission (AUC) and all Africans jointly and severally protect rainforest resources in Africa by

1.1. Reducing the rate of forest degradation and loss of bio-diversity through protected area management, promoting involvement of the community in forest conservation and development on the basis of benefits sharing with the community. Avoid exclusion of local communities from forest management activities.

1.2. Allocation of the continent's forest resources in to protected forest areas, production of forests and manage according to management plan.

1.3. Achieving sustainable use of forest by the local inhabitants and protect them from natural and man made calamities.

1.4. Encouraging joint forest management, intensifying forest conservation in highlands, lowlands and pastoralist area and improve forest policies.

1.5. Supporting a network of effectively managed protected areas and promotes women's participation in forest conservation.

1.6. Organized major logging companies to improve forest management practices.

2. Conserving Forests

Most of Africans' rural and urban poor people depend for their livelihoods almost entirely on natural resources specifically on forests. The AUC and other stakeholders have a duty to conserve forests in Africa and in surroundings by

2.1. Addressing the links between forests and urban-rural poverty alleviation in Africa by developing alternative business plans that create revenue.