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Are mixtures a good option to reduce drought-induced risk of forest decline? Carbon accounting and economic approach

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INTRODUCTION

Context

Drought is a **source of stress affecting forest growth** and resulting in **financial losses** for forest owners and **amenity losses** for society. Such natural events will be more frequent and intense in the future due to climate change.

A way to cope with this increasing risk is to **implement adaptation strategies through silviculture**.

Objective

Economic comparison of different forest adaptation strategies towards drought-induced risk of decline, in terms of financial balance (forest owner) and carbon balance (society).

MATERIAL AND METHODS



Combination of a tree-level forest-growth model (MATHILDE) with a traditional forest economics approach

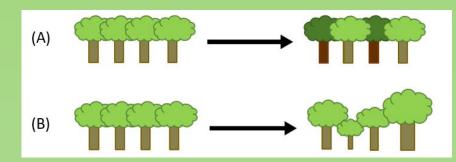
Case study

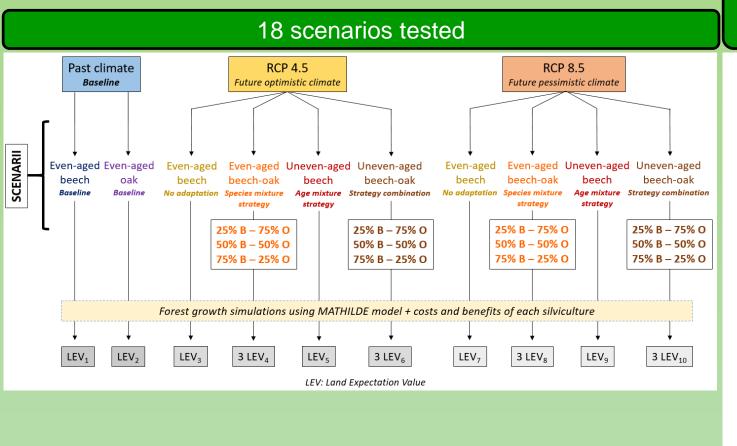
Beech forests in Grand-Est region (France) are predicted to decline or even to disappear.



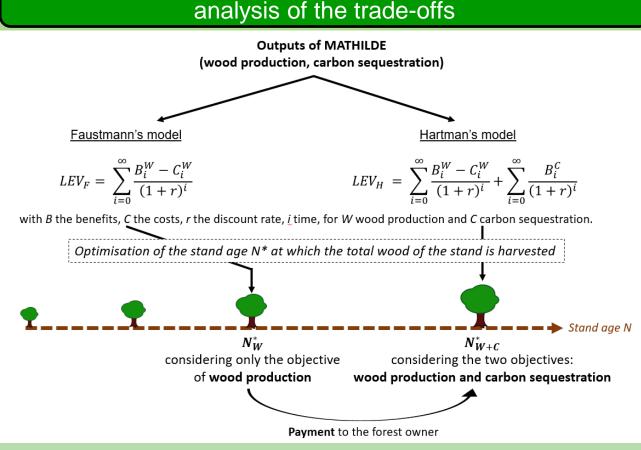
Silvicultural options tested to adapt beech forests (separately and jointly):

- Species mixture with oak species (A).
- Age mixture, i.e., shifting from even-aged to uneven-aged silviculture (B).





Cost-benefit analysis for each scenario and analysis of the trade-offs



MAIN RESULTS

- Impact -**Drought + Climate change Optimal stand age** (N_W^*) and **Faustmann's LEV** (LEV_F) .
- Best economic return provided by adaptation: uneven-aged silviculture with 50% beech and 50% oak (RCP 4.5).
 - even-aged silviculture of pure oak (RCP 8.5).
- Non-adaptation is the worst scenario (RCP 4.5) as well as adaptation (even-aged silviculture with 50% beech and 50% oak in RCP 8.5).
- In process: variation of carbon prices with different accounting methods (market value, shadow price, social cost) to focus on the trade-offs between LEV maximization and carbon storage maximization (adaptation vs. mitigation) and discussion about the additivity/synergy of the two adaptation strategies.

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