

MixForChanges

Mixed forest plantations for climate change mitigation and adaptation

DURATION
 15/12/2020 - 15/03/2024

BUDGET
 250 000 €

PROJECT DESCRIPTION

Context

Forest landscape restoration and afforestation have recently received much international attention as a crucial opportunity for mitigating climate change (CC). Therefore, it features prominently in many political initiatives such as the EU Green Deal and the Bonn Challenge. Yet, the ongoing increase in biotic and abiotic stress driven by CC puts forests under threat. In the face of CC, adaptation and mitigation by forests are ultimately linked, because the ability of forests to sequester carbon (C) in the long run depends on the ability of trees to cope with multiple stresses. A growing body of evidence suggests that mixed forest plantations, i.e., plantations where several tree species are mixed, are more efficient in sequestering C, while better coping with CC-related stress. Mixed plantations thus represent an opportunity for an important nature-based solution for CC mitigation and adaptation. However, monocultures still dominate the world's forest plantations. The reasons for the apparent resistance to mixed plantations among landowners and stakeholders need to be identified and addressed in future forest policies to promote the large-scale expansion of more CC-resilient mixed forest plantations. One of the possible factors that may have prevented the expansion of mixed plantations at large scales is insufficient scientific evidence for practitioners and policy-makers.

Objectives

Using a global network of forest biodiversity experiments (TreeDivNet), we will provide a mechanistic understanding of how tree diversity, species identities and management (thinning and fertilization) influence both the potential of mixed forest plantations to mitigate (C sequestration) and adapt (drought and herbivory resilience) to CC, in a win-win approach. In addition, we will translate this knowledge into guidelines that can be widely adopted by practitioners and policy-makers.

Research approaches

Tree diversity experiments – All empirical research is done in existing experiments of TreeDivNet. This research network comprises 26 experiments spread across the globe, with ca. 1.2M planted trees. All these experiments were based on a common, statistically sound design that allows detection of causal relationships between tree diversity, management and forest ecosystem functioning (incl. C sequestration). In this particular project, we focus on a selection of six 'high intensity' core experiments. These are complemented with another 5 additional experiments in which a subset of the measurements is done. In the synthesis work, existing data from the entire network (i.e. all experiments) will be used to scale up to the global level.

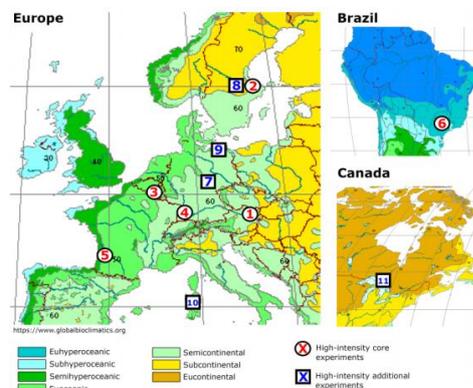


Fig. 1 | Bioclimatic contexts of the high-intensity experiments sampled in MixForChange

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Work packages – the entire project is developed around six interconnected work packages (Fig. 2).

- WP 1 - CC mitigation through C sequestration in mixed plantations
- WP 2 - CC adaptation through drought resilience in mixed plantations
- WP 3 - Effects of biotic interactions on C sequestration and drought resilience in mixed plantations
- WP 4 - Stakeholder perceptions of mixed plantations and adaptation to CC
- WP 5 - Syntheses of mitigation and adaptation potential of mixed plantations
- WP 6 - Capacity building and communication

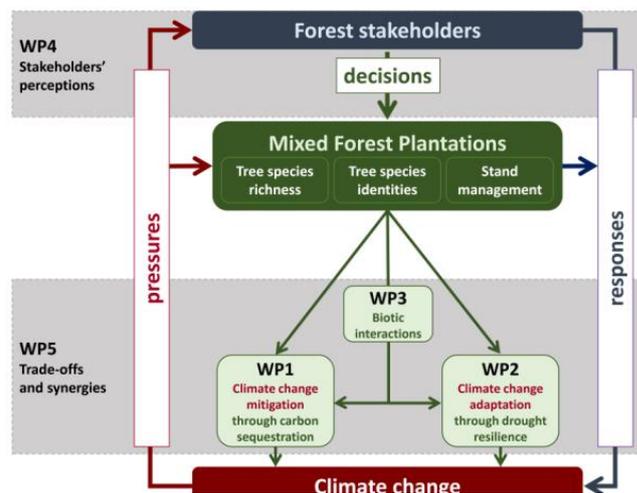


Fig. 2 | Interdependencies of climate change-related stresses and management of forest plantations, and the way they are studied in the project's work packages (WPs).

Expected impact

The functional and mechanistic focus of MixForChange and the contrasting environmental contexts embedded in the network of research sites will allow us to scale-up our findings beyond case studies (experiments), to provide evidence-based guidelines for mixed plantation management in a broad range of environments. MixForChange will analyse in a common framework, and at unprecedented scale, synergies and trade-offs between the CC mitigation and adaptation potential of mixed plantations and the fulfilment of stakeholders' objectives. The societal impact of MixForChange will be ensured by a strong focus on knowledge transfer and capacity-building at all levels of management and governance. MixForChange will thus make an important contribution to promoting mixed forest plantations as nature-based solutions to fight CC.

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LINKS

<https://mixforchange.cirad.fr/>