



Desert plantation systems - a sustainable method of rainfall enhancement and climate change mitigation

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Negative emissions methods like large-scale afforestation are increasingly being considered for mitigating the impacts of manmade climate change. At the same time, weather modification methods, like cloud seeding, aim to counteract increasing water scarcity in arid regions. Large-scale sustainable desert agroforestry plantations can contribute to climate change mitigation, and be used to modify regional climate, particularly rainfall.

Climate impacts from plantations need to be well understood before considering implementation. Typically, impact studies are attempted at continental or global scales, and use coarse-resolution models which suffer from severe systematic errors. This is highly problematic because decision makers should only countenance geoengineering schemes like global afforestation if impacts are understood on the regional scale. We propose a change of paradigm, focusing on high-resolution regional models with sophisticated representations of land-atmosphere feedback and vegetation. This approach allows for studying desert plantations, and the process chain leading to climate modification.

We demonstrate that large-scale plantations enhance regional clouds and rainfall, and derive a novel index for predicting plantation impacts. Thus, desert plantations represent a sustainable climate change mitigation solution through carbon storage and predictable regional climate modification.