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The influence of soil fertility on carbon cycling and storage in temperate tree bioenergy crops

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Short – rotation woody perennials such as *Populus* and *Salix* are often selected for bioenergy crops in temperate climates. In conjunction with providing a renewable crop, bioenergy crops can improve carbon storage in previously degraded soils and associate with beneficial mycorrhizal fungi. Applying nitrogen fertilizers to bioenergy crops can increase yield and carbon sink but may also increase CO₂ emissions through increased soil respiration and N₂O through increased microbial activity which alter population and community dynamics.

Changing environmental conditions due to climate change such as prolonged droughting and increasing intensity of rewetting are also impacting plant-soil interactions. However, there are gaps in the understanding of the mechanisms responsible for plant responses to changing abiotic conditions. Therefore, the scale of future carbon cycling, CH₄ and N₂O emissions by temperate tree species are still very unclear.

To address this my experiment, focuses on two temperate tree species used in bioenergy production known to associate with mycorrhizal fungi. The study will run over two growing seasons, using a randomized block design with four fungal treatments, four nutrient treatments and then implementing two abiotic treatments during the second growing season. I aim to determine how soil nutrient availability influences: i) plant – mycorrhiza associations, ii) plant carbon cycling and storage, iii) soil respiration rates, iv) plant and soil GHG emission rates. v) carbon cycling and GHG emissions under different climate controls.