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Project Case Study:

Belowground carbon sequestration potential of apple trees – Catherine Chapman

Background:

With climate change causing more extreme weather patterns, it is becoming increasingly important to find methods to mitigate against rising carbon dioxide (CO_2) levels in the atmosphere. Apple orchards could play an important role by helping to store carbon in the soil for longer periods of time. Current research is trying to determine the level carbon that is stored in apple orchards both above and below ground. Aboveground storage is better understood than belowground, as the latter involves more complex interactions that need to be considered, including rootstocks and microbial soil communities.

Aims:

My project aims to determine the difference between commercially used apple rootstocks in terms of the amount of carbon being transferred from the tree and stored in the soil as a means to help mitigate against rising carbon dioxide levels and climate change. It will also investigate what influences the carbon transfer from the tree to the soil, including scion varieties, abiotic stresses (e.g. drought) and beneficial microbial populations.

How I am going about this:

- Three different rootstocks (M9, M116 and MM106) all grafted with Cox's Orange Pippin, are being grown in rhizotron boxes in fumigated soil to enable root growth to be monitored over time through regular root imaging.
- Collecting and analysing soil samples for carbon and nitrogen content, and soil (rhizosphere) microbial communities composition at six weekly tree harvests to see if there is a difference between rootstocks
- Also recording aboveground and belowground tree biomass, as well as assessing root samplers for mycorrhizal fungi colonisation to see whether there are significant differences between rootstocks.