Reconstructed soils from waste - a field study at The Lost Gardens of Heligan

Background

In order to gather evidence on the impact of reconstructed soils on plant growth, promote the ReCon Soil project and engage with the general public, a demonstration site was created at The Lost Gardens of Heligan (**Figure 1**). A field trial was designed to act as a demonstration platform for reconstructed soils from waste, to show how they can support plant growth and how they could be used as a viable alternative to topsoil. This case study provides an overview of that field trial and its wider impact.

Questions

- How do reconstructed soils compare to more conventional soil preparation methods?
- Can reconstructed soils support plant growth in the field?
- Are there differences in carbon and nitrogen content?
- Are there differences between microbial communities and relative activity?

Trial site

A reconstructed soil was created by mixing composted green waste and bark, from the gardens, and local sand, a by-product of China clay mining near St Austell. This was mixed onsite in large batches using a small digger. The reconstructed soil was then added as a top soil replacement in a dedicated area of the gardens. These beds were compared alongside double digging, mulch application and no dig soil preparation methods (**Figure 2**). A crop of Swiss chard (*Beta vulgaris* subsp. *cicla*) was planted into these beds and the soils were tested post-harvest for carbon and nitrogen content, and microbial activity.

D	R	M	C	R	D	C	M
C	M	M	R	M	C	D	R

Figure 2. A plan of The Lost Gardens of Heligan plots. R = Reconstructed soil, D = Double dug, C = control (no dig), and M = Mulch

Figure 1. Pilot site location at The Lost Gardens of Heligan

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Results

The rate of growth in the reconstructed soil beds was slower than the other treatments, however the soil did produce a viable crop during its first season. We found significant differences in the amount of carbon and nitrogen in the soils, with much larger amounts found in the reconstructed and double dug soils compared to mulch and no dig methods (**Figure 3 and 4**). The level of microbial activity was not different between any of the treatments.

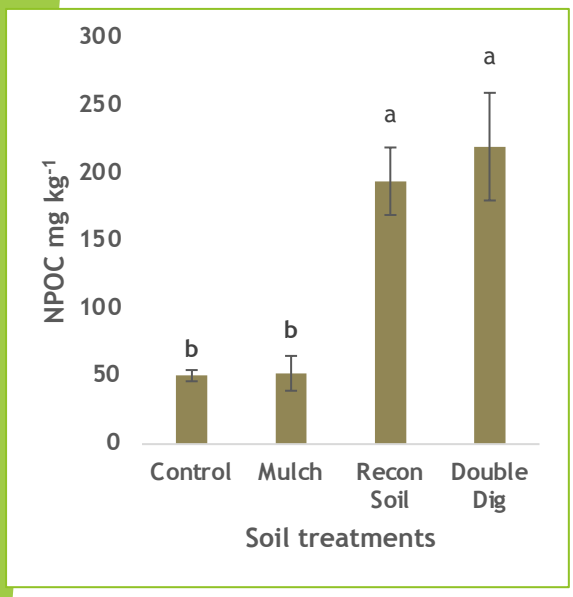

Figure 3. Non purgeable organic carbon (NPOC), p< 0.01

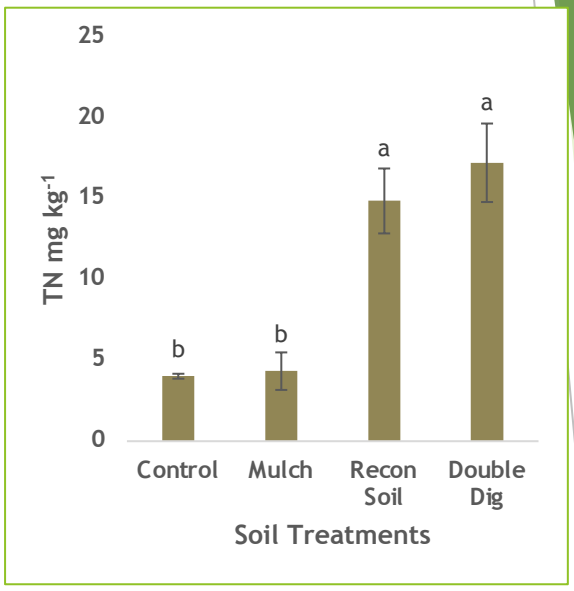

Figure 4. Total Nitrogen, p< 0.001

Impacts

- The **ReCon soil** recipe produced a viable crop in it's first season
- Large amounts of organic matter in mix led to significantly more NPOC which could lead to more total carbon stored over time
- Same result for double digging suggests that same could apply for green waste or other organic matter being dug into soil, this could be a potential solution for increasing carbon stocks in construction soils which have been disturbed or become degraded

Future research?

- The impact of amending degraded soils with green waste and other organic matter requires further study
- How do other crops and plant species grow in reconstructed soils?
- What impact does time have on plant growth in reconstructed soils? Does plant growth improve over time, or do further organic matter amendments need to be made?

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