

The effect of synthetic and organic amendments on water storage of an arable soil

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Irrigation expansion is occurring in Canterbury with much of this expansion planned for shallow stony soils which are limited by depth (< 45 cm to gravels) and hydraulic characteristics (moderate to rapid permeability and low water storage capacity). A potential solution to reduce this soil limitation for the arable industry is to incorporate a soil amendment at cultivation which will improve the soils hydraulic properties to make it more suitable for irrigating.

The objective of this project was to test if the incorporation of organic and synthetic soil amendments could increase water storage of an arable soil (Templeton silt loam) which had been under long term cultivation. The organic amendments tested were municipal compost, sphagnum moss, biochar and dairy shed manure. Synthetic amendments were polyacrylamide, silicate gel and starch gel. To simulate cultivation, amendments were mixed with soil before being packed into soil cores. Water release was then measured from the cores using tension tables and pressure plates. Following on from this experiment, we tested the effect of increasing application rate and reducing maximum particle size of municipal compost.

The initial experiment demonstrated that incorporation of polyacrylamide, dairy manure and sphagnum moss significantly increased ($P < 0.05$) readily available water storage of the soil tested by 23%, 8% and 17% respectively. Polyacrylamide and sphagnum moss were also able to increase the total available water capacity by 23% and 6% respectively. We then found that by decreasing the maximum particle size and increasing application rate of municipal compost we were able to increase readily available storage. These results suggest that amendment incorporation could be a solution to quickly and easily improve the suitability of shallow soils to irrigation.