Tile drainage study - Experiment 2 - Depth

The study was set up at a 30 acre bog belonging to one of the project grower advisors. The subgrade was re-leveled and "keyhole" trenches were dug into the subgrade at every 20 ft, corresponding to the future location of the tiles. The keyholes were filled with sand, the tiles placed on top of the keyhole and then a layer of sand was distributed across the bed and vines were planted. Tile drains were installed, in groups of 5, at two depths below the soil surface (8 and 12 inches to the bottom of the pipe).

Trenching in a keyhole for tile in a renovation.

Finished grade showing tiles extending out of keyholes.

Treatments were replicated four times and gaseous exchange, fruit rot and yield were estimated from a 0.25 m x 0.25 m quadrat randomly placed on the bed at four randomly selected places within each treatment/rep. To assess weed populations in the treatments, we surveyed 16 points (1 m^2 area plots) for each treatment for each rep. For each treatment, 1 "compass" with 8 points (center randomly chosen, 2 plots per cardinal direction, random numbers of steps apart) was measured on the right half of the bog, and another compass on the left half. Soil moisture in the two treatments was measured using logging tensiometers.

Cranberry plants grown under deep tile drainage (12 inches deep) seemed to show high carbon assimilation (A) relative to the shallow (8 inches) treatment (Fig. 1). The rate of carbon assimilation for both treatments is similar if not better than some reported values with cranberry cultivar 'Stevens'. Light saturation was also reached at a photosynthetically active radiation (PAR) of between 600 and 700 µmol m^{-2} s^{-1} which is better than some values previously reported

of 400 µmol m^{-2} s^{-1}. From the look of it, tile drainage somewhat enhanced the rate of carbon assimilation regardless of the tile depth.

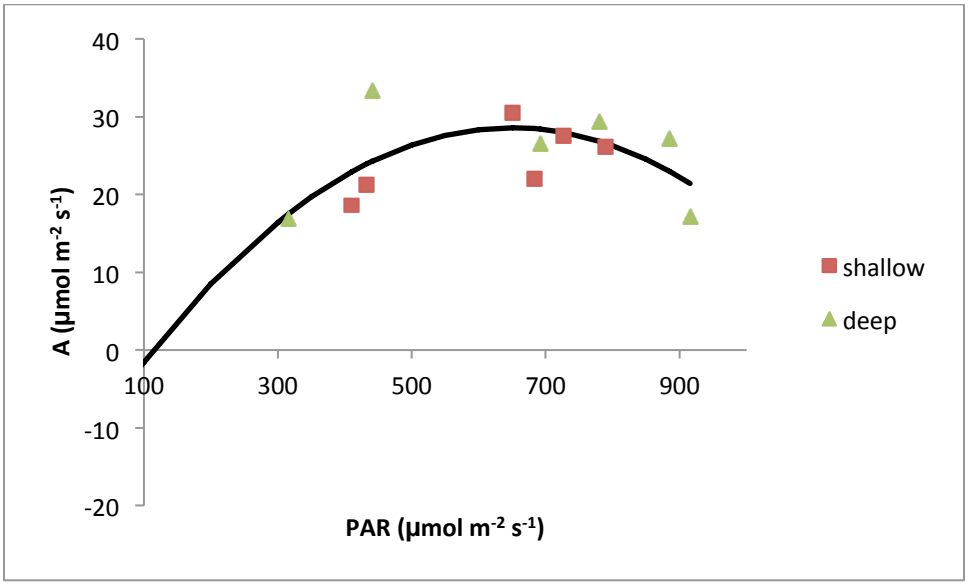

Figure 1. The effect of tile drainage depth and PAR on Carbon assimilation ($y = -0.001PAR^2 + 0.129PAR - 13.48$; $r^2 = 0.39$).

The shallow tile depth was associated with a higher fruit rot of 56% compared to 4% in the deep treatment (Figure 2). This result seems to suggest that the shallow tiles do not adequately drain excess water on the bed while with the deep tile there is adequate drainage resulting in almost no fruit rot. It must be noted that fruit rot is a complex issue that cannot be adequately solved by drainage alone as they are many interacting factors that affect fruit rot.

The fruit yield also followed the fruit rot trend and this should be expected as the deep tile treatment had more usable berries than the shallow tile drainage system. The average fruit yield under deep tile was 85 BBL/acre and 62 BBL/acre under the shallow tile drainage (Fig. 3). It should be noted that this is the first year yield of a recent renovation which has not yet adequately vined-in. We did not evaluate the root systems of each treatment and this might have given us some indications on plant growth or drainage stress effects on the plants.

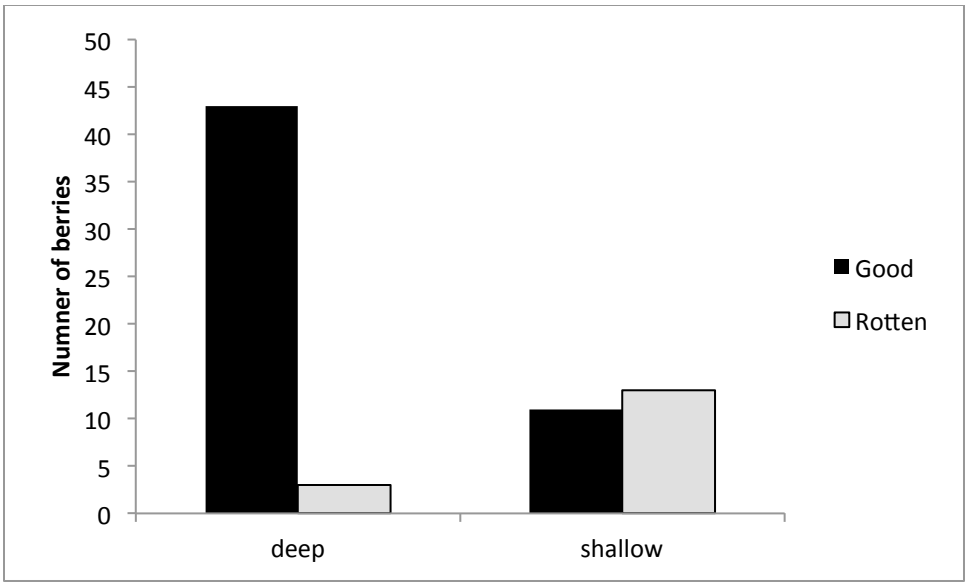

Figure 2. Tile drainage depth effect on the number of good or bad berries in a 0.25 x 0.25 m quadrat at Middleboro, 2014.

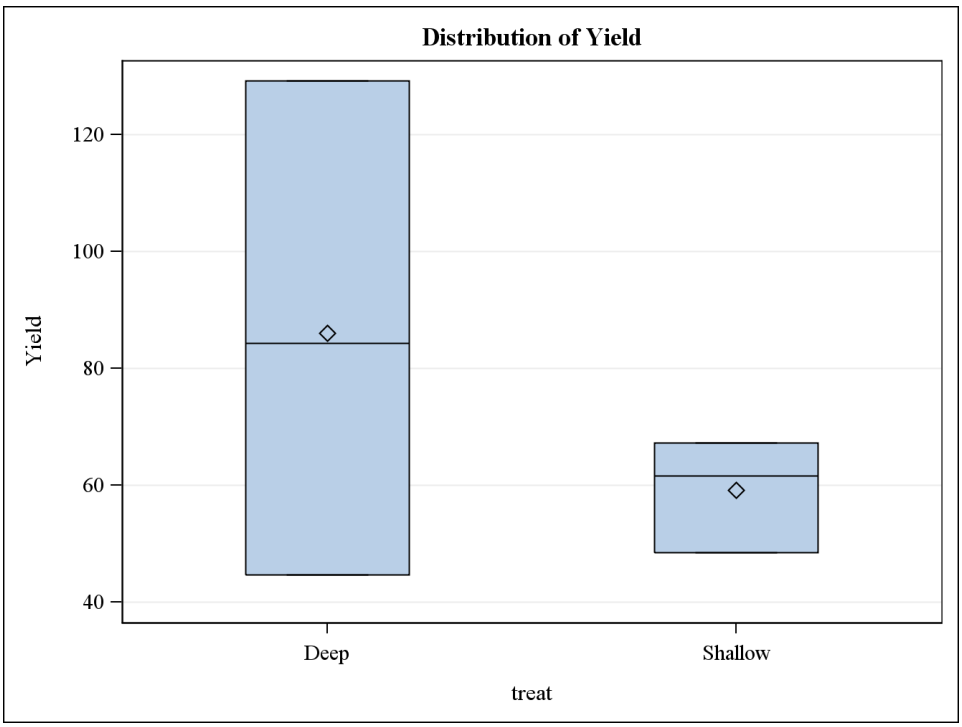

Figure 3: Berry yield in BBL/acre on a one year old renovated cranberry bog with two tile depths (deep and shallow), Middleboro in 2014.

The difference in weed populations between treatments was not statistically significant (Proc GLM). The trend for deep tiles to have more weed cover may be due to the layout of treatments.

Deep treatments were always towards the weedier end of the bog than shallow treatments for each rep.

Treatment	Average weed cover (%) ±SE	Average cranberry cover (%) ± SE	Average number of weed species ±SE
Deep Tiles	51.4 ± 4.85	78.8 ± 3.38	2.81 ± 0.173
Shallow Tiles	39.0 ± 4.36	84.5 ± 3.66	2.60 ± 0.185

Soil tension measurements following irrigation showed that drainage at both the 4-inch and 8-inch depth was more rapid over the deep tiles compared to that over the shallow tiles.