Revisiting the effect of subsurface irrigation and partial rootzone drying on canopy size and yield of Cabernet Sauvignon using remote sensing techniques

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Abstract (250 words)

Irrigation is an essential tool for grape production, especially where rainfall does not meet the optimal water requirements needed to achieve yield and quality targets. Increased evaporative demand of grapevines due to changing climate conditions, and a growing awareness for sustainable farming, require the improvement of irrigation techniques to maximize water use efficiency, i.e. using less water to achieve the same yields or the same water but larger yields. In this study, the performance of Cabernet Sauvignon vines was compared under three irrigation techniques: conventional aboveground drip irrigation, subsurface irrigation installed directly under the vine row, and partial rootzone drying in which two subsurface lines were buried in the middle of the two interrow spacings on each side of the vine row with irrigation alternated between the two lines based on soil moisture content. Equal irrigation was applied to all treatments, at 80% of crop evapotranspiration. Canopy size was measured as fractional cover using UAV-sensed imagery, and yield was mapped spatially with a yield monitor mounted on a harvester. Fractional cover values were larger in vines subjected to partial rootzone drying, while there were no differences between vines receiving conventional irrigation and subsurface irrigation under the vine row. Yield was increased up to 70 % for vines under partial rootzone drying compared to vines receiving conventional drip and under-the-vine subsurface irrigation. A significant increase in water use efficiency was achieved by combining subsurface irrigation and re-locating the drip lines to the interrow spaces, also suggesting treatment-induced modifications to root distribution.

Keywords: canopy size, irrigation techniques, partial rootzone drying, remote sensing, subsurface irrigation.