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MODELING OF SOIL WATER TO INSURE A SUITABLE DEPTH AND SPACING OF SUBSURFACE DRIP IRRIGATION TUBING FOR ALFALFA

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Abstract

A major design issue in the implementation of a subsurface drip irrigation system is the determination of the appropriate depth of placement of the drip emitters to allow basic farming operations with heavy equipment while still providing adequate water to the crop. In this study, the program HYDRUS-2D is used to determine the wetting pattern from a subsurface drip emitter installed at 50 cm for three soils typically found in Southern CA, a Sandy Clay Loam (SCL), a Clay Loam (CL) and a Loam (L). The model was used to determine the extent of wetting above, and laterally from the drip tubing after twelve hours of irrigation the day of the cut with an irrigation frequency of every three days. The vertical “rise” of water above the drip line after this irrigation period was 27 cm, 30 cm and 22 cm for the SCL, CL, and L, respectively. Then classical soil mechanics theory was utilized to calculate the increase in stress on soil at any depth due to a load on the surface from a typical farm tractor. The minimum depth placement to avoid failure would be 40 cm below the surface in a SCL soil. A similar analysis for the CL and L yielded minimum installation depths of 35 cm and 40 cm respectively. This type of analysis is helpful in determining the depth of placement of subsurface drip irrigation lines to ensure adequate trafficability of soil irrigated with subsurface drip irrigation systems.

Keywords: soil moisture, HYDRUS 2-D, soil shear strength.