Chapter 11 – Water Use and Dry Matter Production

Section 11.1
1. Why do we expect a more or less intimate link between dry matter produced and cumulative water use?
2. Define transpiration efficiency (TE) and transpiration ratio (TR). Name the analogous terms for evapotranspiration. In doing so the term 'water use efficiency' (WUE) should become clarified.
3. Bierhuizen and Slatyer suggested in 1965 that TR increases with the saturation deficit (SD) of the air. Please explain the consequences for crop production in an arid and hot climate.

Section 11.2
1. What is the k value of the Bierhuizen and Slatyer equation? What does it characterize?
2. Give some examples of k for various crops.

Section 11.3
1. Calculate for barley the transpiration efficiency (TE) and the transpiration ratio (TR) at Akron, Colorado and Göttingen, Germany. The value of k (Eqn 11.2) at each location is 5.5 Pa and 4.0 Pa, respectively. The average daytime saturation deficit (SD) for the growing period is given in Table 11.4. Also calculate the transpirational water use at the two locations, with a pre-set yield goal of 13 t ha^{-1} (biomass). Finally calculate biomass yield for 270 mm of water extracted by the barley roots.