**TD N°6: Soil and Water**

## Part 1: Soil Density and Porosity

**Exercise 1 – Bulk and Particle Density** A soil sample has a **dry mass (Ms)** of 300 g and occupies a **total volume (V)** of 200 cm³. The **true particle density (ρs)** is 2.65 g/cm³.

**Questions:**

1. Calculate the **bulk density (ρas)**.
2. Calculate the **porosity (p)** of this soil using the relation:
   $p=1-\rho as/\rho sp$
3. What does the porosity value indicate about the soil's structure?

**Exercise 2 – Void Ratio** Using the data from Exercise 1:

1. Calculate the **void ratio (e)**.
2. Convert it back to porosity using:
   $p=e/1+ep$
   Verify your result from Exercise 1.

## Part 2: Water Content and Retention

**Exercise 3 – Gravimetric Water Content** A moist soil sample weighs 280 g. After oven-drying, it weighs 250 g. The dry soil volume is 180 cm³.

**Questions:**

1. Calculate the **gravimetric water content (w)**.
2. Calculate the **volumetric water content (θ)**, assuming $\rho_e=1.0$ g/cm$^3$

**Exercise 4 – Water Characteristic Levels** A loamy soil has the following water contents (in % of total volume):

- Saturation: 45%
- Field Capacity (CC): 35%
- Permanent Wilting Point (PWP): 15%

**Questions:**

1. Calculate the **Available Water Capacity (AWC or RU)**.
2. If RFU = 50% of RU, calculate the **Readily Available Water**.
3. Interpret what happens when soil moisture drops below RFU.

## Part 3:

**Exercise 5 :** Given the following textures, rank them in order of increasing **Available Water Capacity** and justify:

- Sandy soil
- Silty loam
- Clay loam

**Q6)** Explain how capillary water supports plant growth and how practices like hoeing or mulching can impact the water balance in the root zone.