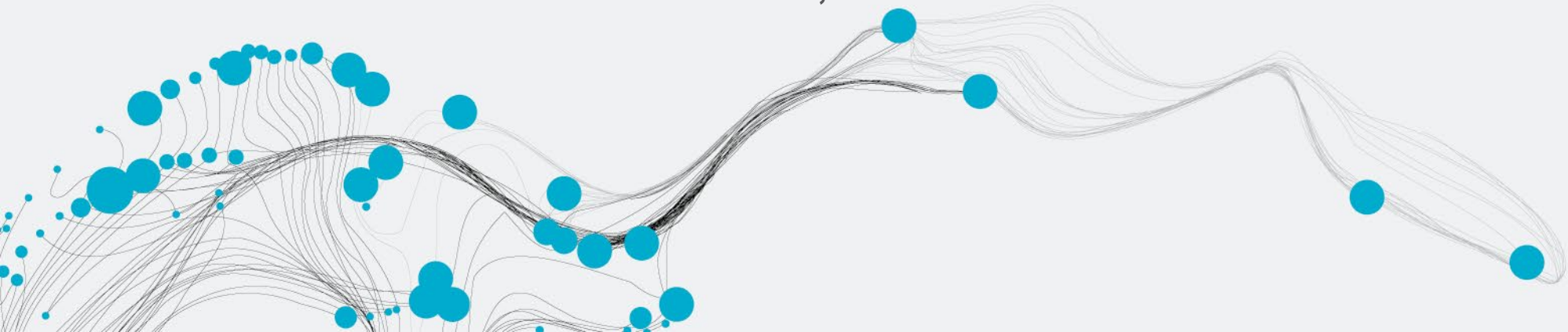
Faculty of Geo-Information Science and Earth Observation, ITC

This HE Teaching Material was supported by the EGU Higher Education Teaching Material Grant 2023

CROP WATER PRODUCTIVITY

AN ONLINE SHORT COURSE BY DR. EGOR PRIKAZIUK WITH SUPPORT OF THE EUROPEAN GEOSCIENCE UNION, EGU



YOU WILL LEARN TO

1. **Explain** the link between **crop yield** and **crop water demand** (reading, lecture)

2. **Link** the **components** of crop water productivity (CWP), plant productivity, evapotranspiration, with the respective **Earth Observation (EO) based modelling techniques** (reading, lecture)

3. **Calculate crop yield** from EO-based **gross primary productivity** (GPP) estimates (exercise, Excel)

4. Identify **phenological metrics** (start, end of the growing season) from EO data (exercise, Excel)

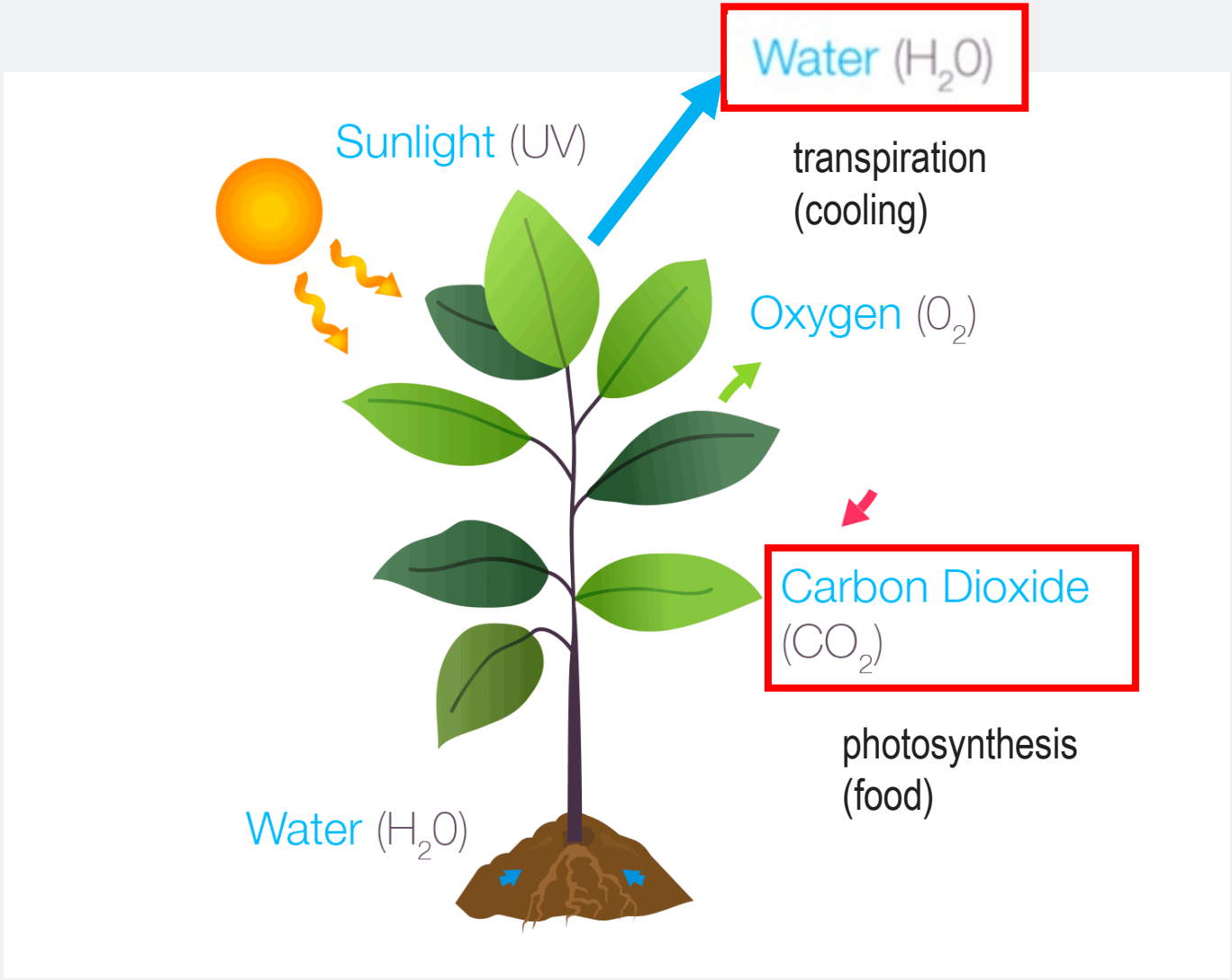
5. Produce **meaningful**, growing season-related **estimates** of CWP (exercise, WaPOR)

6. Conclude on the **efficiency of the water management scheme** in the study area (case study)

CROP WATER PRODUCTIVITY

DEFINITION

- Yield = Land Productivity = $\frac{harvested\ biomass}{area\ used}$
- Water Productivity = $\frac{harvested\ biomass\ [per\ area]}{water\ used\ [per\ area]}$
- Biomass – total weight of plant material



- Every time a plant consumes CO_2 it releases water

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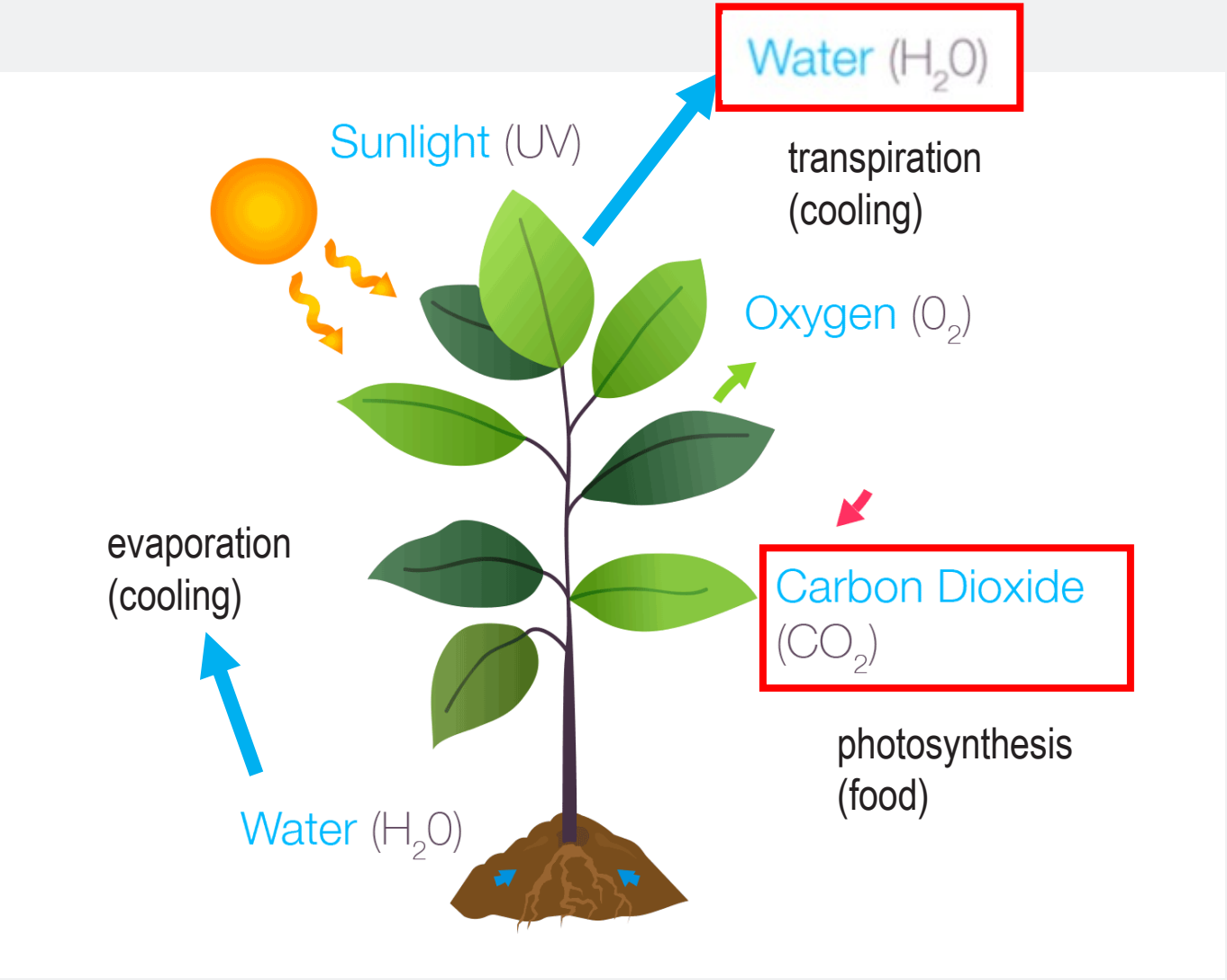

- Every time a plant consumes CO_2 it releases water
- Soil loses water as well

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$$CWP = \frac{harvested\ biomass\ [per\ area]}{water\ used\ [per\ area]}$$

who	Harvested biomass	Water used
Plant	Net photosynthesis (NPP)	Transpiration (T)
Researcher	Gross primary productivity (GPP)	Evaporation + Transpiration (ET)
Farmer	Yield per field	Irrigation per field/canal

$$net\ biomass\ WP = \frac{\Sigma_{SOS}^{EOS} NPP}{\Sigma_{SOS}^{EOS} T}$$

$$gross\ WP = \frac{\Sigma_{SOS}^{EOS} GPP}{\Sigma_{SOS}^{EOS} ET}$$

$$CWP = \frac{yield}{\Sigma_{SOS}^{EOS} ET}$$

Aggregation over the growing season
SOS – start of growing season
EOS – end of growing season

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