Irrigation

Fundamental indicators

Evaporation (E) – mm/day
Transpiration (T) – mm/day
Evapotranspiration (ET) – mm/day
Potential evapotranspiration (PET) – mm/day
Water use efficiency (WUE) – kg/m^3 (or L/kg)

Possible methods for reducing drought

- **Choice of appropriate cultivation method**
- **Water conserving tillage methods**
- **Minimalisation of the extent of weed**
- **Cultivation of drought-resistant plant species**
- **Development of irrigation and melioration**
- **Horticultural crops (vegetables, fruits) grown in irrigated fields**

Main elements of the irrigation technology

- **Aim of irrigation**
- **Method of irrigation**
- **Irrigation need - amount of irrigation water used (rate of irrigation – irrigation depth, amount per season)**
- **Time of irrigation, irrigation frequency (regime)**

Possible irrigation aims

- **storing moisture in the soil**
- **helping soil tillage**
- **leaching out of harmful amount of nutrients**
- **enhancement of seed emergence**
- **enhancement of transplant rooting**
- **supplementing the precipitation**
- **supplying nutrients (fertigation)**
- **refreshment of plants**
- **raising humidity**
- **frost protection**
- **helping the harvest (root crops)**

Methods of irrigation

- **sprinkler**
  - **linear and central pivot**
  - **rain star system**
  - **towed unit**
- **micro**
  - **micro sprinkler**
  - **drip (elevated, surface, subsurface)**
- **surface**
  - **flood**
  - **furrow**
- **(subsurface)**

Evaluation of sprinkler irrigation

+ suitable for every irrigation aim
+ irrigation intensity is easy to control
+ easy to automate
+ requires little labour
+ does not need landscaping
± cooling effect
± increase in microclimate humidity
– water loss by evaporation
– sensitive to the wind
– uneven water distribution
– could cause damage to the soil and to the plant (droplet size)

Evaluation of drip irrigation

+ water saving
+ energy saving
+ easy to automate
+ precise, evened distribution
+ ideal for distribution of nutrients
+ does not emit water between the rows
± does not wet plant surface
± does not increase humidity
– expensive (?)
– needs better water quality – plugging (physical, chemical, biological)
– suitable just for a few irrigation aims

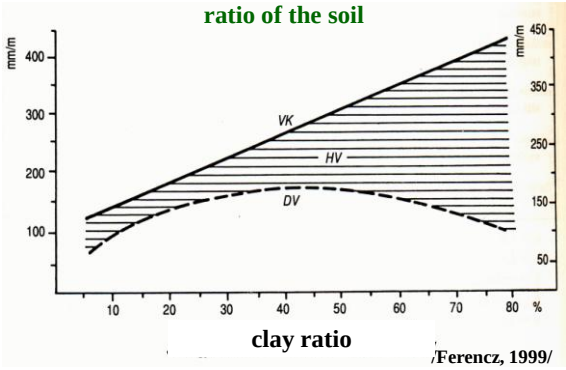
Amount of irrigation water used

Can depend on:

- water uptake volume and pattern of the plant
- dynamics of natural precipitation
- water holding capacity of the soil
- aim of irrigation
- depth of irrigation (intended percolation depth in the soil)

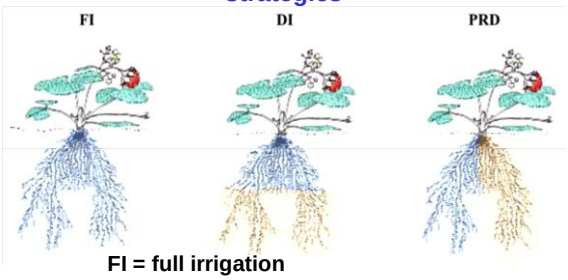
- Amount of irrigation is expressed in mm:
  1 mm = 1 L/m^2 = 10 m^3/ha
  1 mm wets about 1 cm depth of soil

Water holding capacity (VK), unavailable water (HV) and available water (DV) plotted against clay ratio of the soil



/Ferencz, 1999/

Schematic diagram of different irrigation strategies



FI = full irrigation

DI = deficit irrigation

PRD = partial root-zone drying

Timing of irrigation

Can depend on:

- soil water content
- climatic factors (T, rh%, wind)
- plant parameters (turgor pressure, canopy surface temperature, stomatal conductance, etc.)
- phenological stage (critical stages)
- part of the day