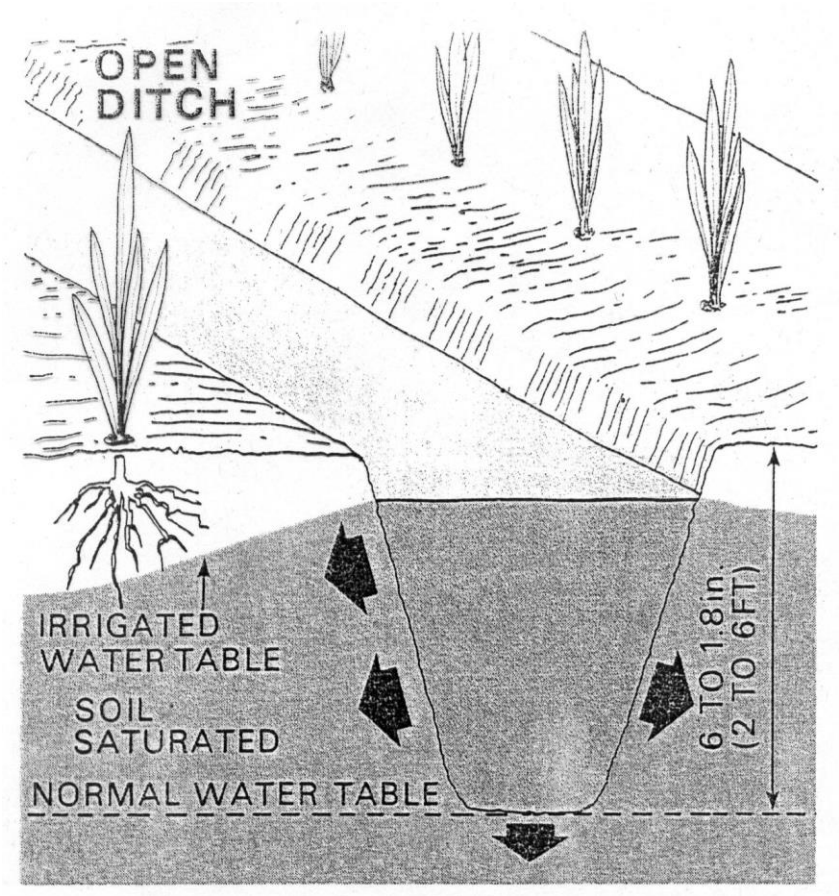
Bachelor of Biosystems Technology
Faculty of Technology
South Eastern University of Sri Lanka

BSE 11042 Principles of Irrigation

Sub-Surface Irrigation

- Sub-irrigation - a water table management system
- Providing subsurface drainage (pipes or drains) to lower or maintain an existing water table
  Controlled drainage capturing rainfall
- Water applied under the surface
- Upward Water movement in soil - Upward salt movement
- Canals/ditches or perforated pipes/drips used to manipulate water table
- If drips used, need closed spacing



Sub-irrigation by open ditch method

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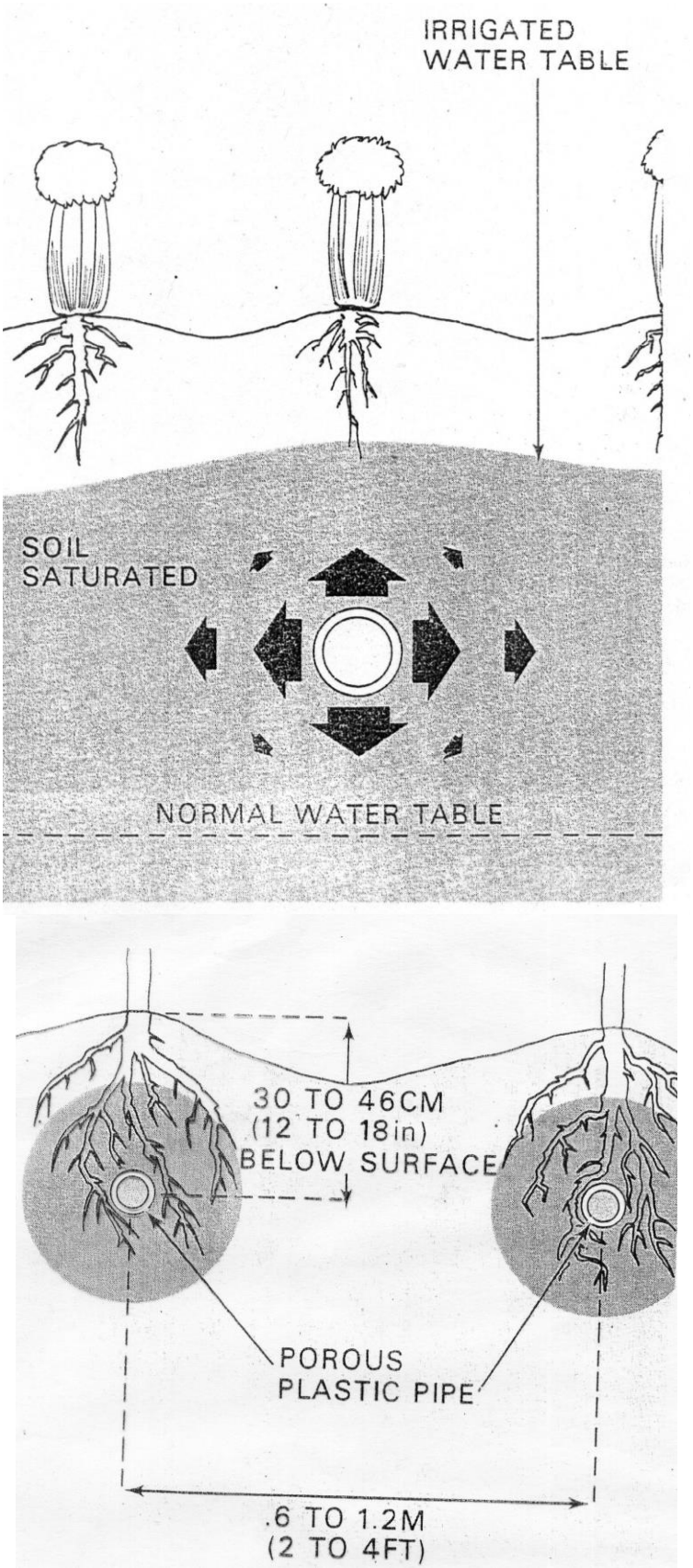

Sub-irrigation by perforated pipe/ sub surface drip

Requirements for sub-surface irrigation:

- Impervious sub soil at a depth of 2 m or more or a natural high water table
- Very permeable sub-soil
- Permeable loam or sandy loam surface soils
- Moderate slope
- High horizontal and low vertical permeability

Advantages sub-surface systems:

- Reduces need for pumping
- Can incorporate sub-irrigation with a subsurface drainage system with low additional cost.
- Reduces drainage pumping costs
- Relatively easy to automate water control
- Reduce crop stress due to water logging
- Better root development environment
- Maximize use of rainfall
- Savings in water and energy
- Utilization of marginal lands
- Reduced labor inputs in operation
- Economical use of water
- Water logged areas could be reclaimed and used
- Irrigation does not interrupt cultivation of field
- Ease of machinery use at any time (Provide trafficability)
- Fully controlled water and fertilizer applications (sub-surface drips)
- Less weed infestation-Savings in herbicide costs

Disadvantages sub-surface systems:

- Risk of developing saline and alkaline conditions
- If drainage is insufficient to carry excess water and salts, it needs large open drains
- Increased ground water table in some cases where drainage becomes essential
- Expensive (high capital cost) when pipes used
- Liable to be damaged by deep ploughing
- Labor intensive when irrigation and drainage is done by the same system
- Need trained labor when same system is used for irrigation and drainage
- Total system costs can be relatively high in soils that have low hydraulic conductivity
- Water quality must be high.

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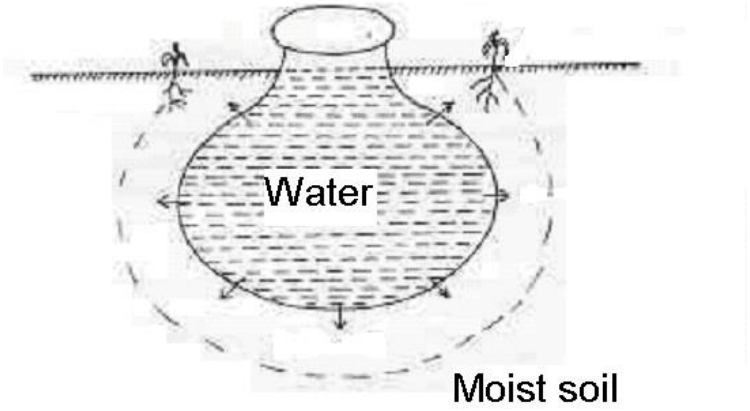
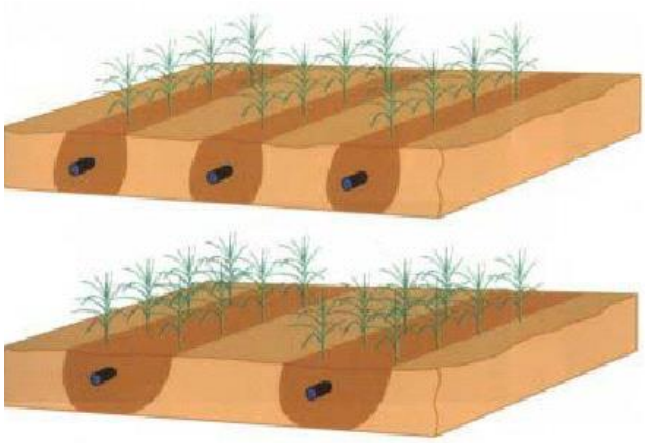


Pitcher irrigation

Sub-surface drip irrigation



Sub-surface drip wetting pattern