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

BSE 11042 Principles of Irrigation

Methods of Irrigation Scheduling

1. Book keeping methods

Many book keeping methods are proposed.

Method 1:
In these methods, the moisture status of soil is calculated at various times using the evapotranspiration values (estimated by any one of the methods). The crop is irrigated when the estimated soil moisture level attains a pre-determined value.

For example: a crop has 200 mm of available water in the root zone at field capacity and it has been decided to irrigate at a deficit of 100 mm. The following table can be constructed using the evapotranspiration values.

Date	Age of crop	Estimated ET (mm/d)	Accumulated deficit
1	20	4.0	4.0
2	21	6.0	10.0
3	22	7.0	17.0
4	23	5.0	22.0
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.			
8		4.0	100.0 Need irrigation

Method 2:

- Moisture status of soil is calculated
- Evapotranspiration values are used
- Irrigate when soil moisture level attain pre determined value

$$\theta_i = \theta_{i-1} - 100\left(\frac{ET - ERF}{RD}\right)$$

where,
θ_i – Volume basis moisture content at the end of day i
ET – Evapotranspiration
ERF – Effective rainfall
D – Root Depth

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Date	ET	ERF	θ_i
1/June	8.3	0	
2	8.0	1.3	
3	6.5	0	
4	7.3	0	
5	7.5	0	
6	8.3	0	
7	5.7	2.5	
8	7.5	0	

RD = 0.6 m
MAD = 14%
θ on morning of June 1 is 23%

2. Soil Moisture Methods

Soil moisture content is monitored using any of the procedures and the field is irrigated when the predetermined deficit is reached. It should be recommended that the availability of soil moisture is not the same over the entire range from wilting point to the field capacity and crop yields could be affected by water stress long before the soil moisture reaches the wilting point. The interval of irrigation for each crop are therefore varies depending on the depletion allowed for that crop at the particular growth stage.

3. Methods based on plant factors

Different plant characteristics like growth of certain parts, stems, fruits of plants, plant color, leaf movement and growth are considered as indicators of the need of irrigation.

The disadvantage of this method is that the growth measurements might also be influenced by other factors than soil water (eg. Nutrient availability). Color of leaves in some crops like cotton, beans and groundnut changes to bluish or dark green as moisture stress increases. However, care should be taken that the color change is not due to any plant disease. In date palm elongation of leaves is taken as an indication of the moisture conditions and irrigation is applied when the rate of elongation declines.

Appearance and growth:
- Leaf shoot wilting
- Leaf color – disease, nutrient deficit could also change color
  - If irrigated based on this, the production could be affected

Leaf Temperature:
- Reduced transpiration rate – stomatal closure
  - Can be sensed remotely
- When the critical level reaches, irrigate.

Leaf water potential:
- Remove leaves and measure potential
  - Age, exposure to radiation, time of day affect the results

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Stomatal Resistance:

Index of water is needed

High resistance means need for water

Time and skill is needed.

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