

References

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Irrigation Defined

Irrigation generally is defined as the application of water to soil for the purpose of supplying the moisture essential for plant growth.

Purposes of Irrigation

1. To add water to soil to supply the moisture essential for plant growth.
2. To provide crop insurance against short duration of droughts.
3. To cool the soil and atmosphere, thereby making more favorable environment for plant growth.
4. To wash out or dilute salts in the soil.
5. To reduce the hazard of soil piping.
6. To soften tillage pans and clods.
7. To reduce the hazard of frost.

Irrigation may be accomplished in four different ways:

1. By flooding
2. By means of furrows, Large or small
3. By applying water underneath the land surface through sub-irrigation, thus causing the water table to rise.
4. Or by sprinkling or drip.

Sources of irrigation water

- A. Precipitation.
- B. Atmospheric water other than precipitation.
- C. Flood water.
- D. Ground water.

Precipitation

To be of greatest benefit, precipitation should have the following characteristics:

1. Amounts should be sufficient to replace moisture depleted from the root Zone.
2. Frequency should be often enough to replenish the soil moisture before plants suffer from lack of moisture.
3. Intensity should be low enough so that water can be absorbed by the soil.

Atmospheric water other than precipitation

The atmospheric conditions which generally prevail to make this source of water significant are:

1. Considerable dew formation.
2. Fog and clouds.
3. High humidity.

Flood water

Flood water is similar in some respects to irrigation water, but it is not supplied by man. As floods pass over the surface of the land, water is absorbed by the soil and stored for subsequent use by plants.

Ground water

Ground water is water beneath the soil surface when voids in the soil are substantially filled with water.

Upward movement of ground water by capillarity from the water table into the root zone can be a major source of water for plant growth.

Note 1) If ground water is within the normal root zone is definitely restricts plant growth. 2) If ground water is too near the surface the lands' ability to economically produce most crops becomes almost nil. 3) However a water table within the lower portion of The root zone supply a considerable amount of water and there by reduce the cost of irrigation

more than it offsets the loss of production. The optimum depth of the water table is that depth which gives the maxim economic return.

ضمن منطقة R.Z فإنه يعيق نمو النبات

إذا كان GW

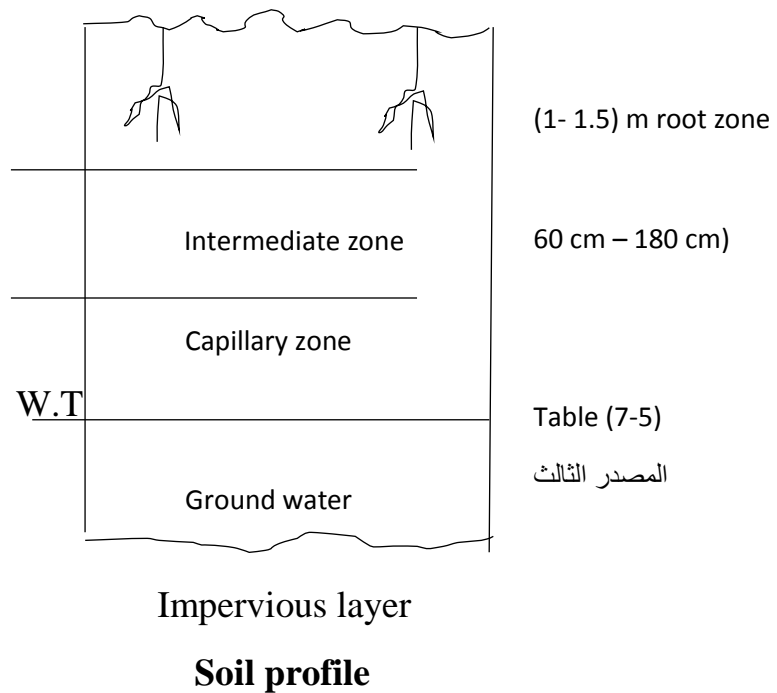
إذا كان GW قرب السطح (سطح الأرض) فإن قابلية التربة على انتاج المحاصيل تصبح صفر (معدومة)

إذا كان GW قريب جداً من R.Z (في الجزء الأسفل منها) فإنه المفضل.

The optimum depth of the water table is that depth within the lower portion of the root zone.

Soil – Water Relations

Root – Zone: Is the depth overburden that penetrated by the roots vegetation

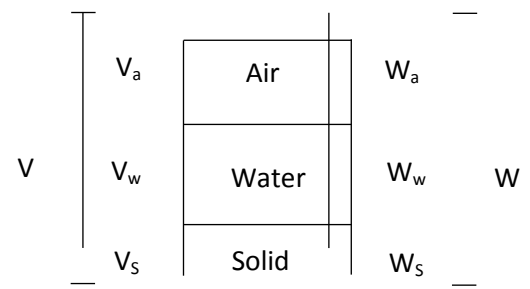


This root zone should have the following properties: -

- 1 – Be well irrigation.
- 2 – Be free from harmful salt.
- 3 – Have plants organic matter.
- 4 – Be well aeration.

Soil classified into four parts: -

- 1 – Mineral part (Clay, Sand, silt)
- 2 – Organic matter.
- 3 – Soil water
- 4 – Soil air



When the soil is saturated with water, volume of the air = 0

When the soil is dry, volume of water = 0

Physical properties of the soil that effect on irrigation water

1) Soil Texture

It is the properties if soil which depends on the size of particles.

Soil can be classified according to (USDA) (U.S department of agriculture)

Soil	Diameter (mm)
Very gravel coarse sand	1-2
Coarse sand	0.5 – 1.0
Medium sand	0.25 – 0.5
Fine sand	0.1 – 0.25
Very fine sand	0.05 – 0.1
Silt	0.002 – 0.05
Clay	< 0.002

*For soil with small particle (fine texture) (Such as clay Porosity, swelling , cracks , shrinkage, high capillary pore space, high water holding capacity (W.H.C)

*For soil with large particle (Coarse texture) (Such as non-capillary pore space, low (W.H.C) , well drainage , well aeration

2) Soil Structure

It is the property of soil which depends on the arrangement of the soil particles

Structure of soil effect on: porosity, water holding capacity (W.H.C), aeration, permeability