CHAPTER (7) TRICKLE IRRIGATION

Advantages of Trickle Irrigation

1- A drip system produces healthy, fast-growing plants.

2- Drip watering keeps the moisture content of soil relatively constant and ensures that oxygen remains available to the root system.

3- Drip irrigation gives you the ability to put water exactly where it’s needed and keep paths and areas between plants dry. This reduces both waste and weeding.

4- Water lost to evaporation is negligible compared to overhead watering.

5- Drip can be designed for minimum runoff.

Advantages of Trickle Irrigation

6- You can deliver equal amounts of water to plants over a wide area.

7- A drip irrigation system is easy to install. Since no trenching is needed, you can install a system in an existing landscape with no damage to your plants' root systems.

8- The greatest advantage for the home gardener is time savings. The simple action of opening a valve replaces all the time spent watering by hand. With the addition of an automatic timer, you can go on vacation or cope with a busy schedule while your garden flourishes without you.

Disadvantages of Trickle Irrigation

1- The clogging of system components by particulate, chemical, and biological materials. Clogging can cause poor uniformity of application and if it continues long enough, can severely damage the crop.

2- Costs are, however, generally comparable to solid-set sprinkler system, but are higher than those of surface irrigation systems except when extensive land leveling is needed.

3- A salt accumulation problem can occur when only a portion of the root zone is wet and saline waters are being used for irrigation.

Suitable Crops

Drip irrigation is most suitable for row crops (vegetables, soft fruit), tree and vine crops where one or more emitters can be provided for each plant.

Suitable Slopes

Drip irrigation is adaptable to any farmable slope.

Normally the crop would be planted along contour lines and the water supply pipes (laterals) would be laid along the contour also.

Suitable Soils

Drip irrigation is suitable for most soils.

On clay soils water must be applied slowly to avoid runoff.

On sandy soils higher emitter discharge rates will be needed to ensure adequate lateral wetting of the soil.

Suitable Irrigation Water

One of the main problems with drip irrigation is blockage of the emitters.

All emitters have very small waterways ranging from 0.2-2.0 mm in diameter and these can become blocked if the water is not clean.

Thus it is essential for irrigation water to be free of sediments.

If this is not so then filtration of the irrigation water will be needed.

Trickle Irrigation

Trickle Irrigation for a Crop

Trickle System Layout

Trickle irrigation system

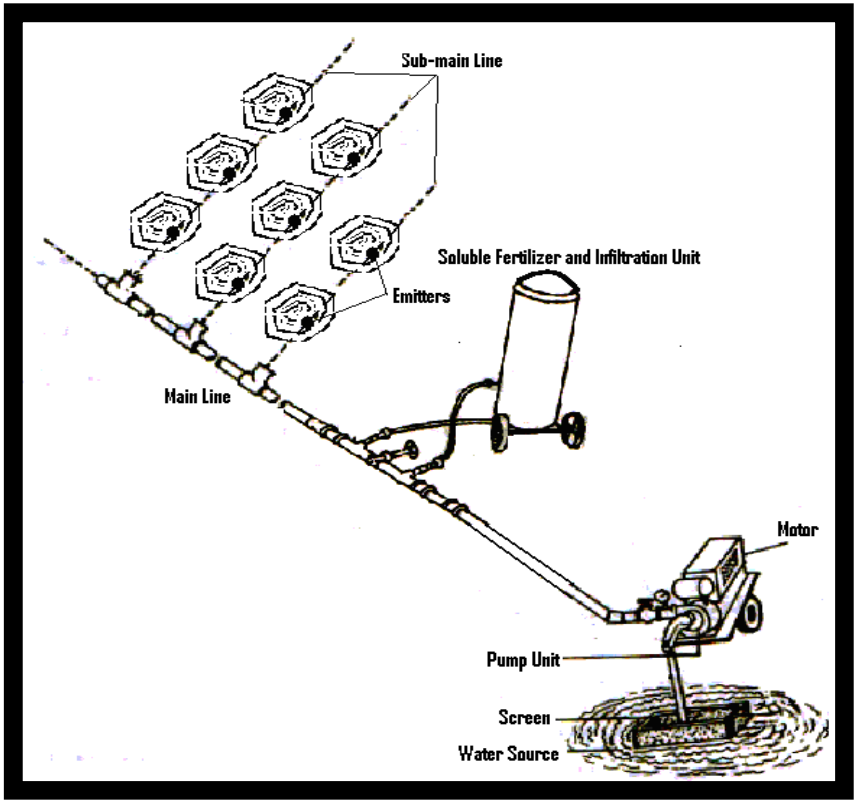
Components are:

1- Pump unit.

2- Control head.

3- Main lines, sub-main lines, and Laterals.

4- Emitters or Drippers .



Trickle System Layout

Pump Unit

- Takes water from the source and provides the right pressure for delivery into the pipe system.

Control head

- Consists of valves to control the discharge and pressure in the entire system. It may also have filters to clear the water.

Trickle System Layout

Main, sub-main lines and laterals

- Supply water from the control head into the fields.
- Made from PVC.

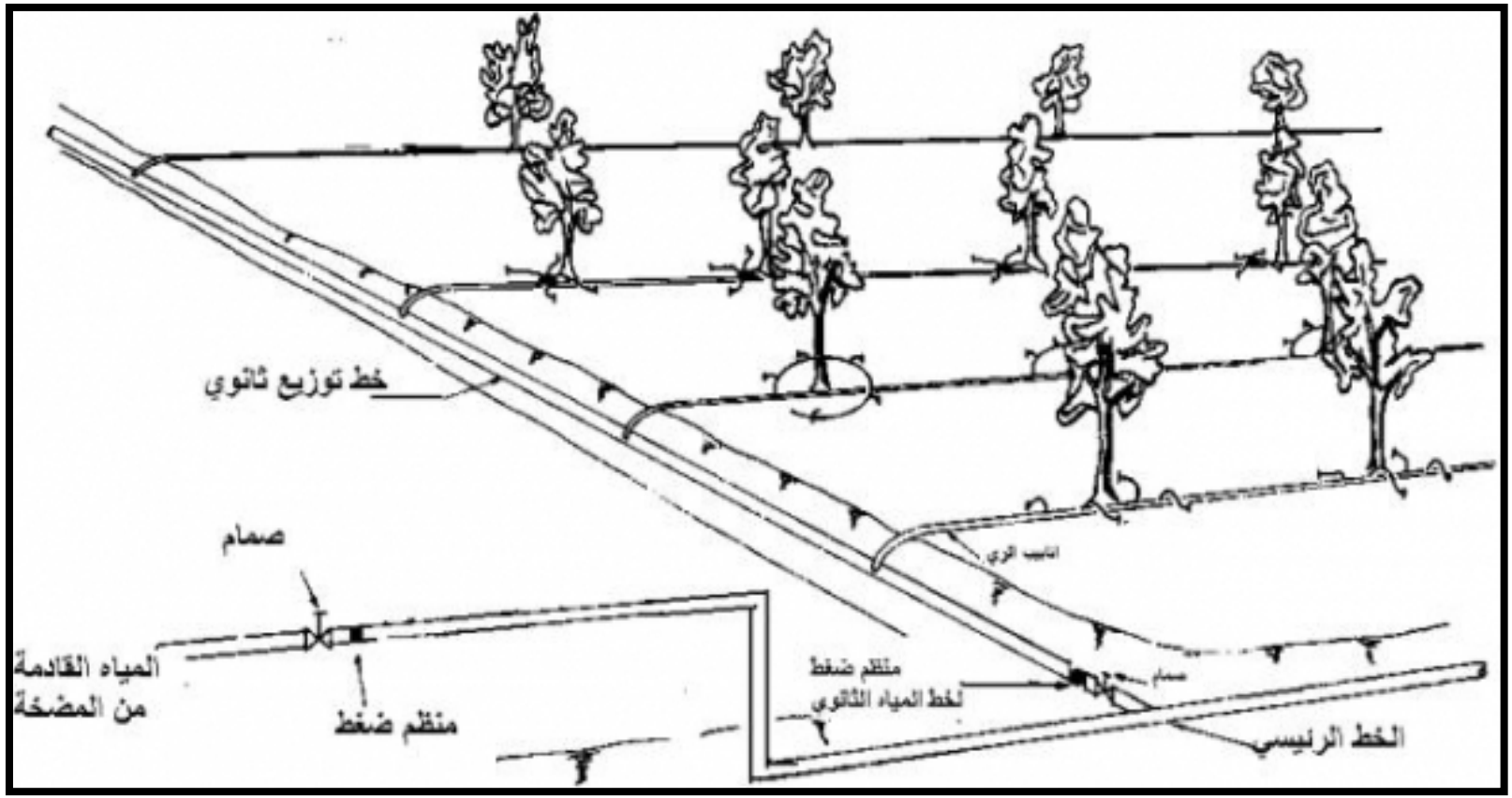
Trickle System Layout

Emitters or Drippers

- used to control the discharge of water from the lateral to the plants.
- They are usually spaced more than 1 meter apart with one or more emitters used for a single plant such as a tree.
- For row crops more closely spaced emitters may be used

Control head

Main, sub-main lines and laterals



Emitters or Drippers

System Capacity

$$Q = (A*q / N* s_e * s_l)$$

Q: the discharge of the pump (m3/sec),

A: area of the field (m2),

q: the discharge of emitter (m3/sec),

N: number of operational units,

se: the distance between emitters on laterals (m),

sl: the distance between laterals (m).

Number of Operation Units

$$\mathbf{N \leq H_i / H_t}$$

Hi : the time interval between two successive irrigations (day),

$$\mathbf{Hi = d_w / C_u}$$

d_w : required water depth (mm),

C_u: consumptive use of the crop (mm/day),

H_t: the total time for operating the emitter (day),

$H_t = d_g * s_e * s_l / q$

d_g : actual irrigation depth = d_w / irrigation efficiency

Example 1

Determine trickle system capacity for an area 125 fed, if

a- The system efficiency is 85%,

b- the distance between emitters on laterals = 0.6 m,

c- the distance between laterals = 1.2 m,

d- the discharge of emitter = 2 l/hr,

e- required water depth = 2.4 cm,

f- consumptive use of the crop = 6 mm/day,

Solution Steps

$Q = (A*q / N* s_e * s_l)$

$Q = (125 * 4200 * 2 * 0.001) / (60 * 60 * N * 0.6 * 1.2) = 0.405 / N$

$N \leq H_i / H_t$

$H_i = d_w / Cu = 24 / 6 = 4$ days

$H_t = d_g * s_e * s_l / q = [(24*10\text{-}3/0.85) * 0.6 * 1.2] / (2*0.001) = 10.16$ hr = 0.423 days

$N \leq 4 / 0.423$ $\qquad$ $N \leq 9.45$

N = 8 (The emitter can make two movements in the day in one irrigation (4days));

Q= 0.405/8 = 0.051 m3/sec = 51 l/sec.

Thank You