

# Irrigation Systems

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# Outline

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What is irrigation

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Why it is needed

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When it is needed

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How much is needed

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Where to get the water from?

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How to apply the water?

# What is irrigation

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Storing Water

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Diverting Water

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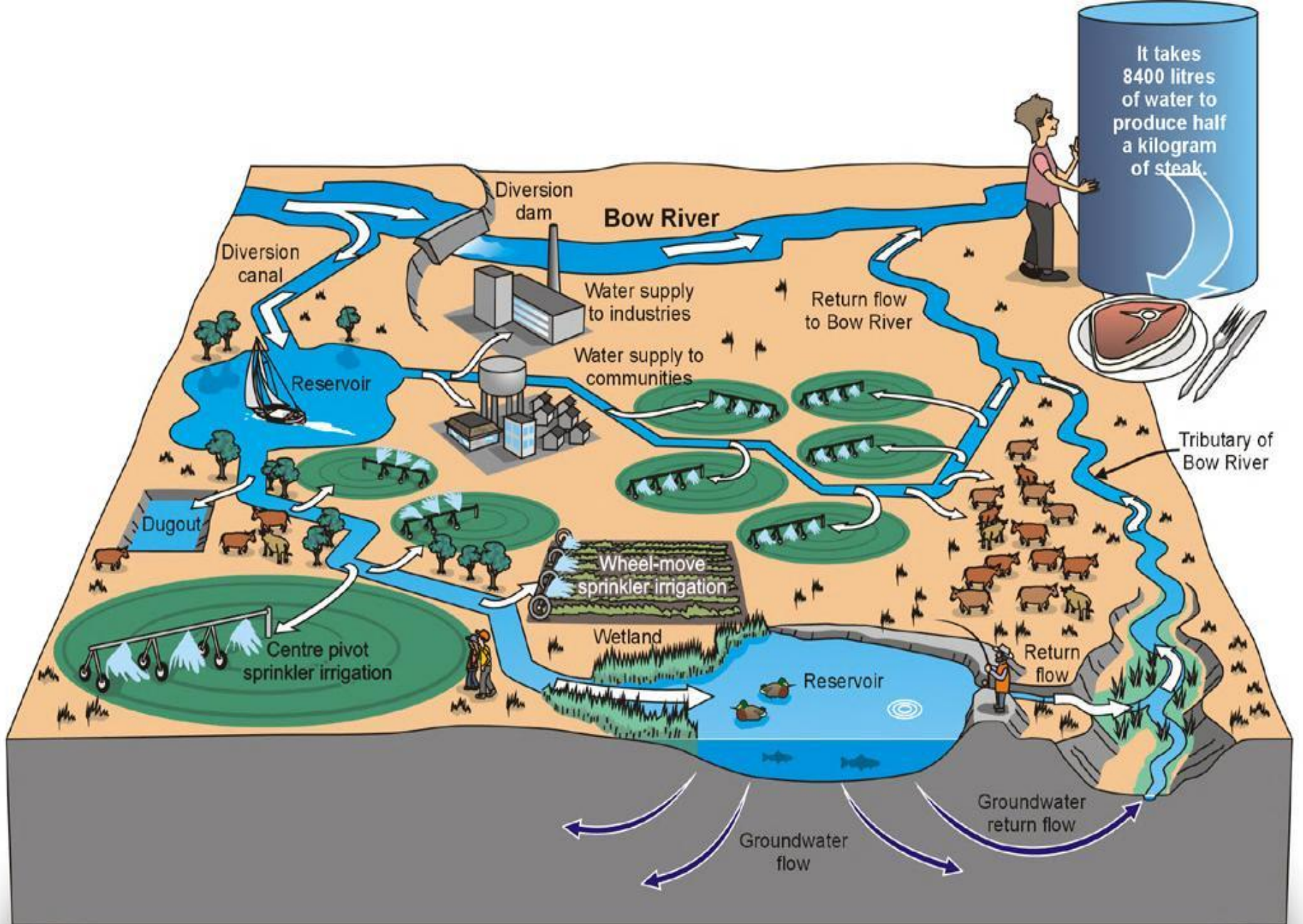
Spreading Water (Applying Water to Plant Roots)

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Consuming Water

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Returning/Draining water



# Why is it needed?

**Plants need  
water for  
photosynthesis  
(Transpire)**

**Water  
evaporated  
from soil**

**Sun Energy  
evaporates  
water**

**Rainfall in  
summer is not  
enough**

# When it is needed

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When soil moisture drops

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To a level where it might be hard for plants to extract it

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When rainfall is not enough

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Other times

# Where to get the water from?

## Surface

- Rivers, Streams, Creeks
- Lakes
- Springs
- Reservoirs

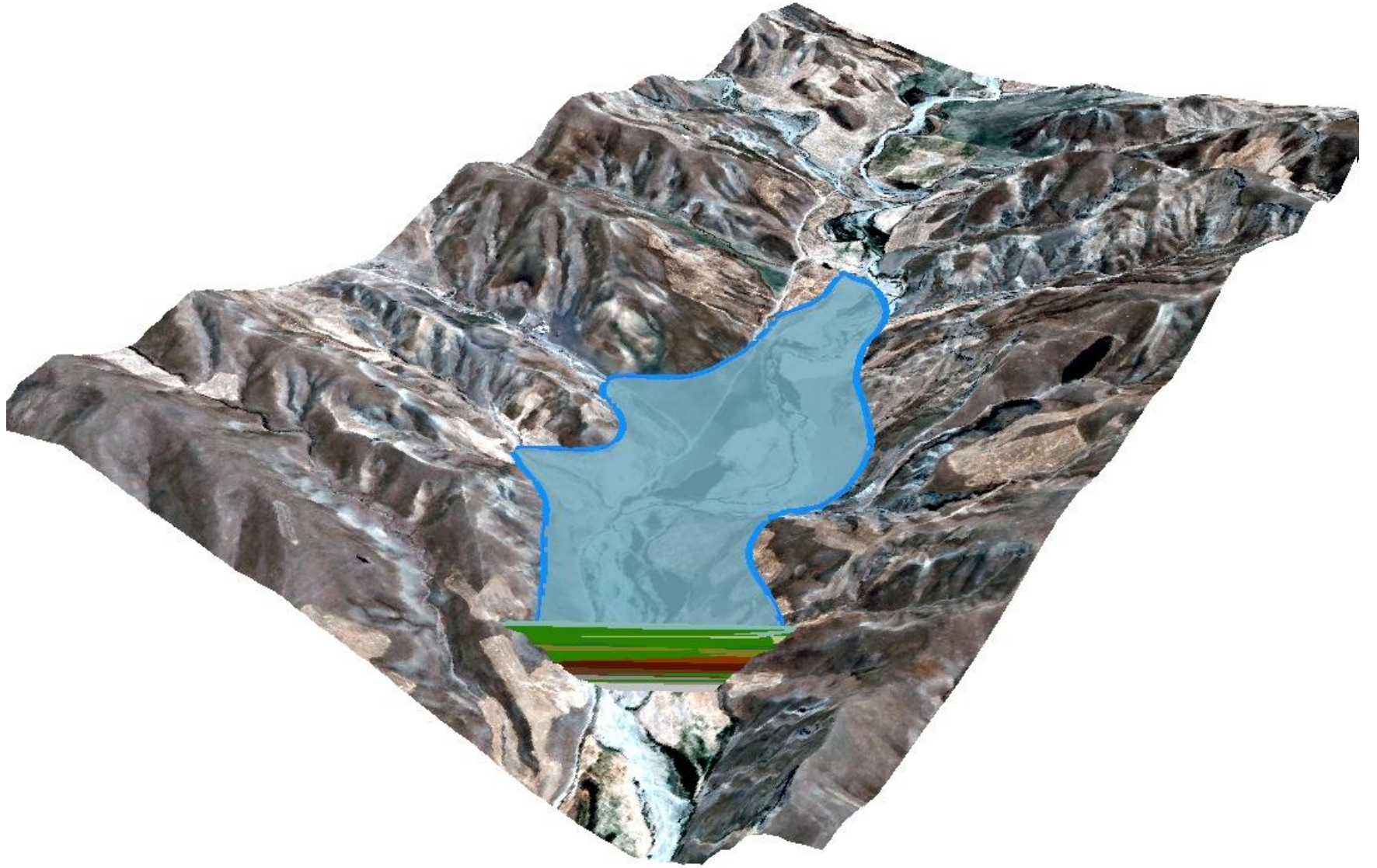
## Underground

- Shallow Wells
- Deep Wells

# Surface Water : Rivers and Dams







# Conveyance Systems: Canals



# Pipes



# How to Irrigate



# Irrigation Methods

- By Gravity (elevation difference .i.e slope)
  - Surface
  - Sub-irrigation (using water table)-uncommon
- Pressurized, requires energy /Pumps or elevation difference
  - Sprinkle (higher pressure)
  - Drip (lower pressure)

- Egypt (1840)



# Surface Irrigation

- More than 80% of total irrigated areas in the world
- Types:
  - Flooding (6000 years old – Rice, China)
  - Furrows
  - Basins
  - Borders

# Basin Irrigation





# Basin Irrigation



# Furrow Irrigation



# Furrow irrigation with siphons from earthen canal



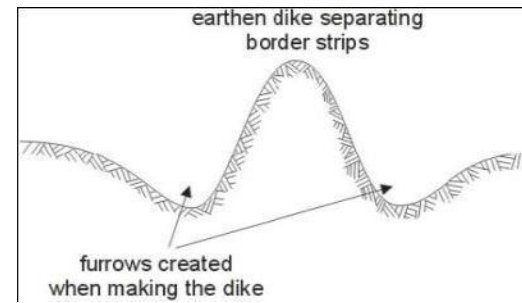
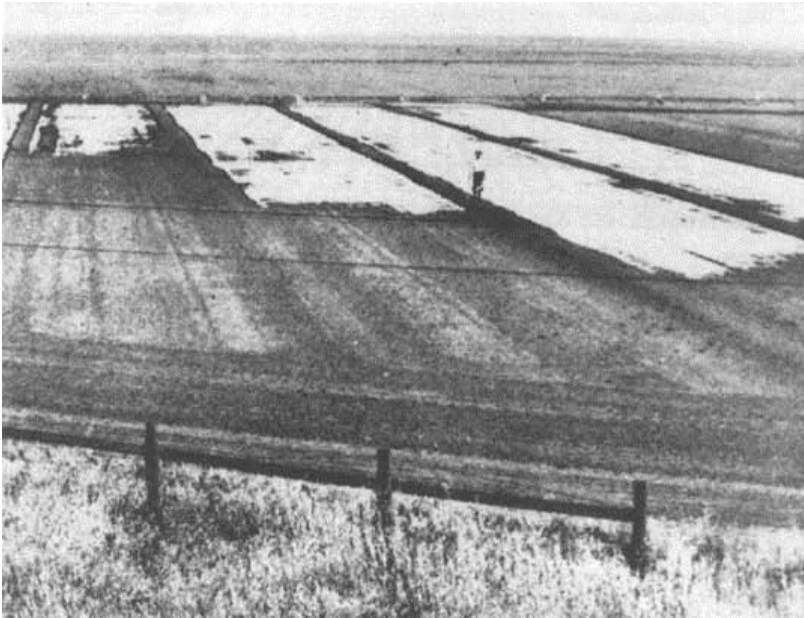
# Furrow Irrigation



# Furrow Irrigation



# Border Irrigation



# Border Irrigation





Sprinkle and Trickle


# PRESSURIZED



**bubbler**



# Types of Sprinkle Irrigation




1. Stationary or solid-set for orchards and perennial crops

2. Semi-portable or hand-moved with fixed main lines and movable laterals

3. Low pressure under-tree sprinklers in orchards

# Types of Sprinkle Irrigation



4. High pressure for field crops or over-tree

5. Center pivot

6. Linear move

# Portable Sprinklers



# Center-Pivot



types:

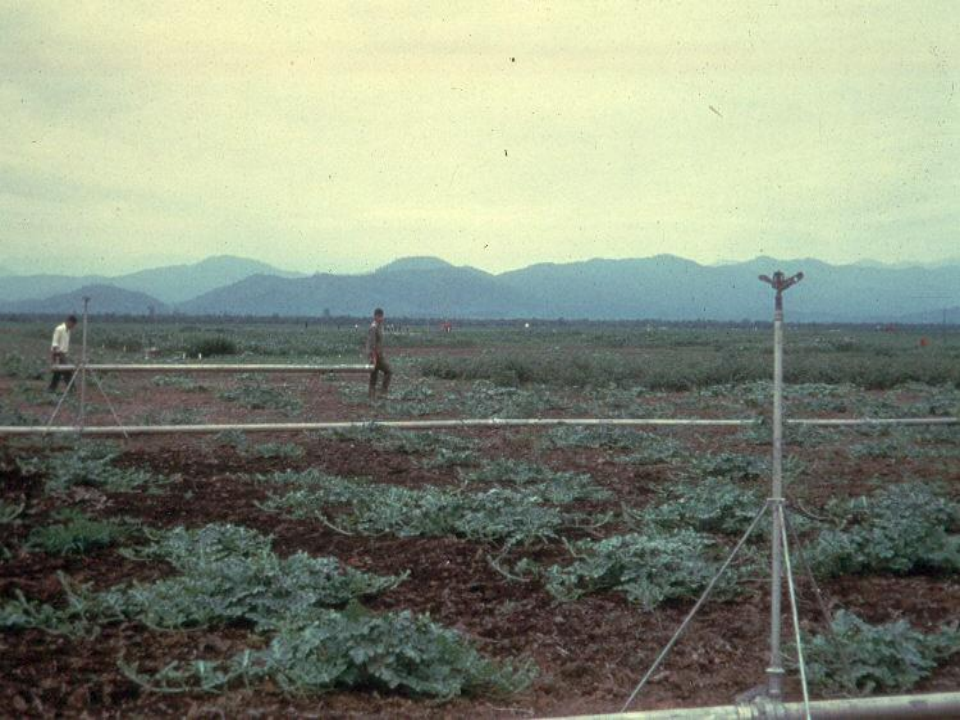
# 1. Stationary or solid-set

- for orchards and perennial crops



## 2. SEMI-PORTABLE OR HAND-MOVED WITH FIXED MAIN LINES AND MOVABLE ATERALS





# 3. Portable

- For crop germination or for irrigation supplemental to rainfall





# Types:

## 5. High pressure such as big gun sprinklers

- For field crops or over-tree,



TYPES:

## 5. CENTER PIVOT



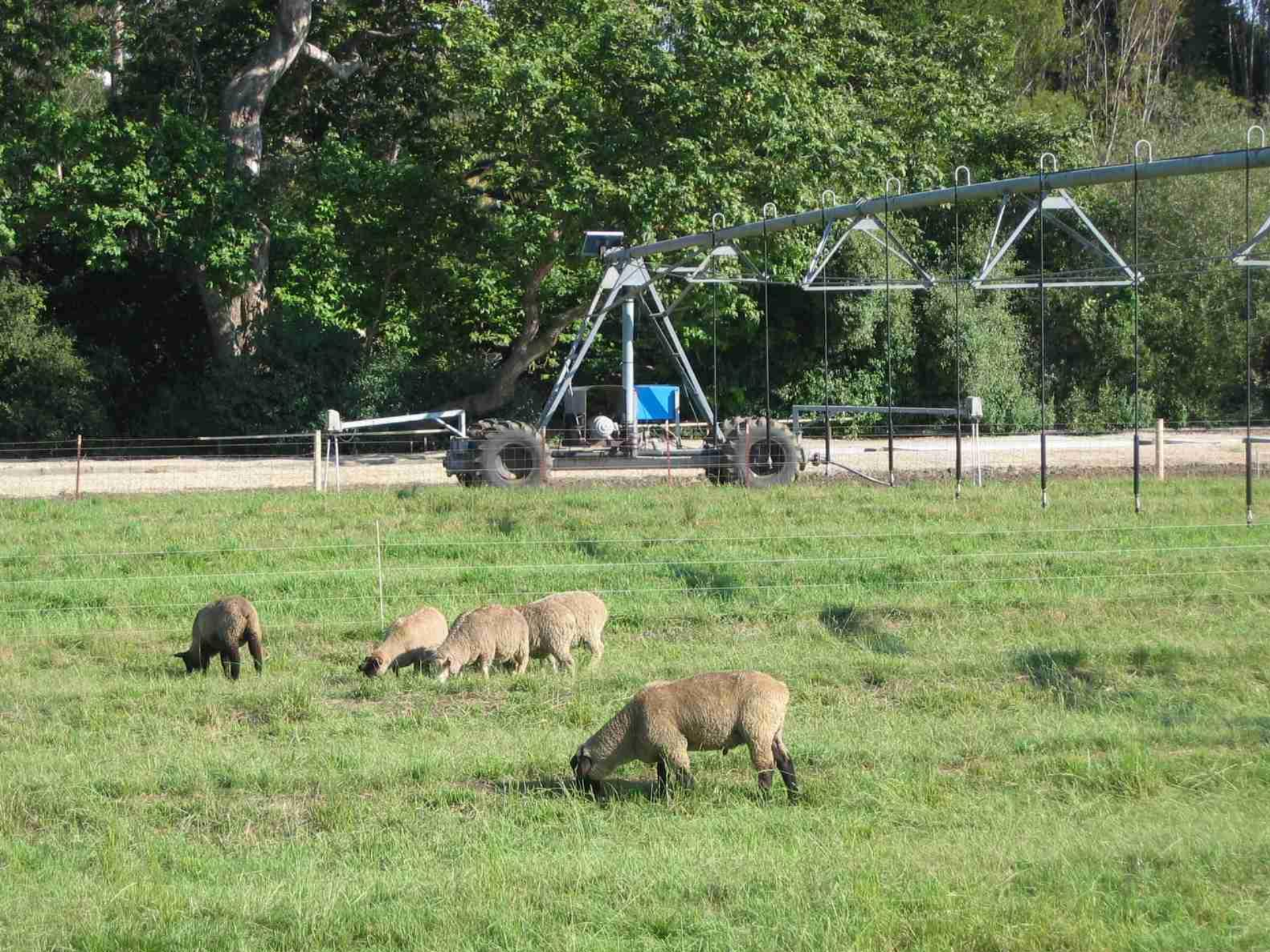


## TYPES: 6. LINEAR MOVE



# Linear Move

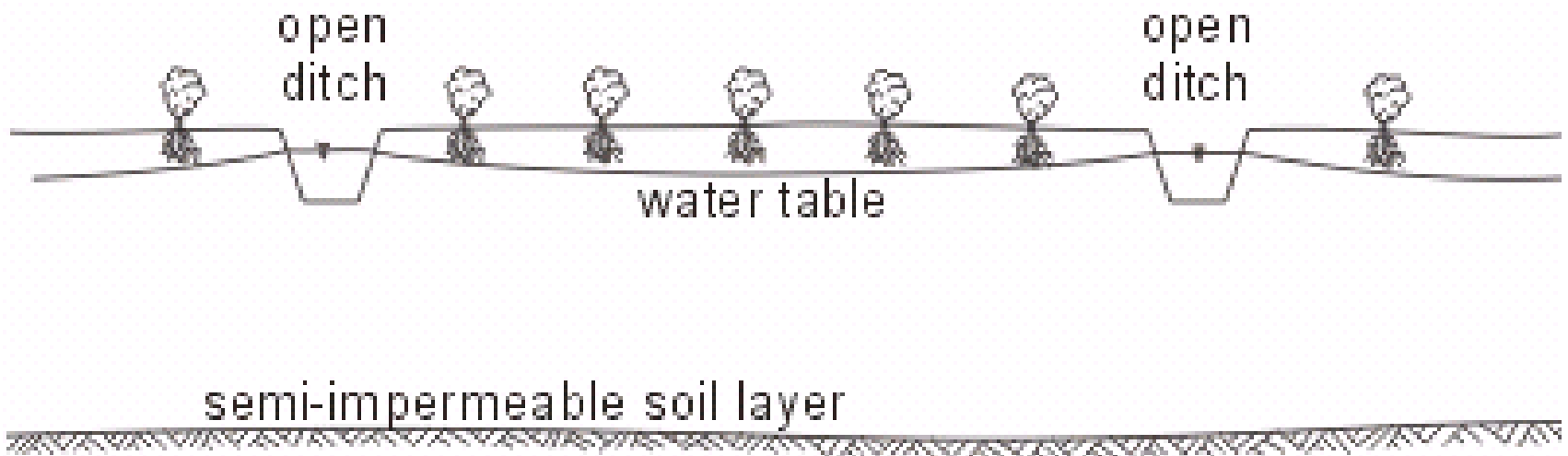






# Sub-Irrigation

- Controlling shallow groundwater
- Needs a water table close to plants root zone
- Not widely used





# Drip Irrigation

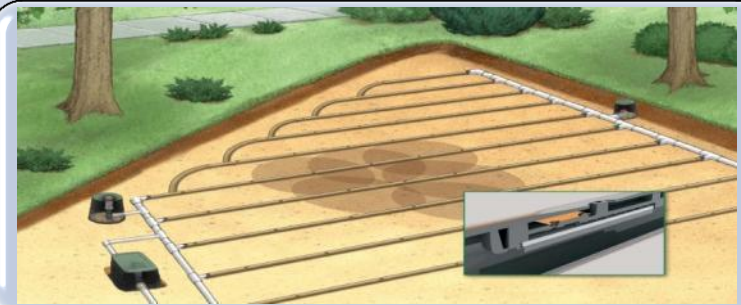


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# Drip or Trickle Irrigation



# Micro-irrigation Systems: Methods



## Surface applicators

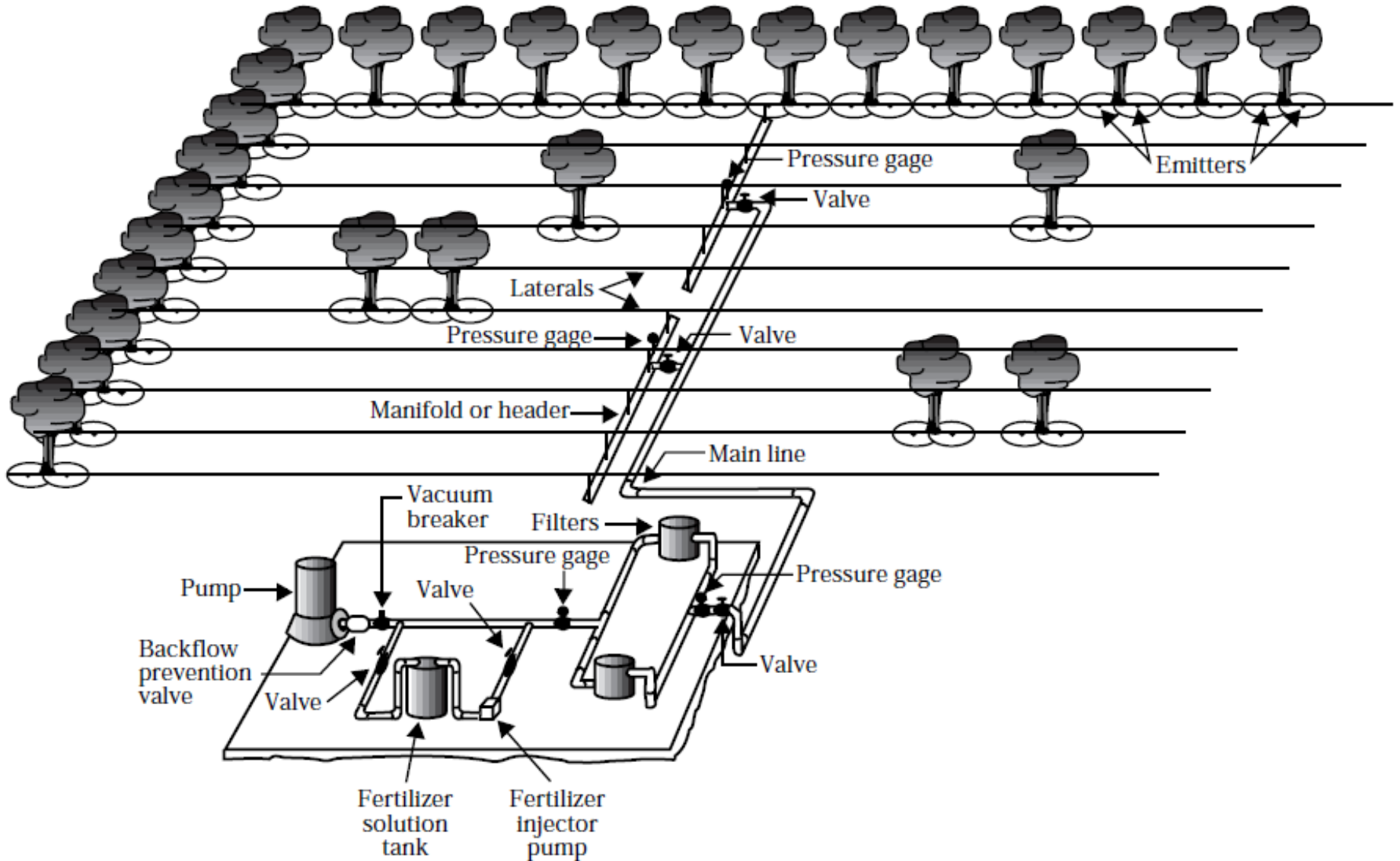
- Emitters
- Micro-sprayers/Micro-sprinklers
- Bubblers
- Misters

## Sub-surface applicators

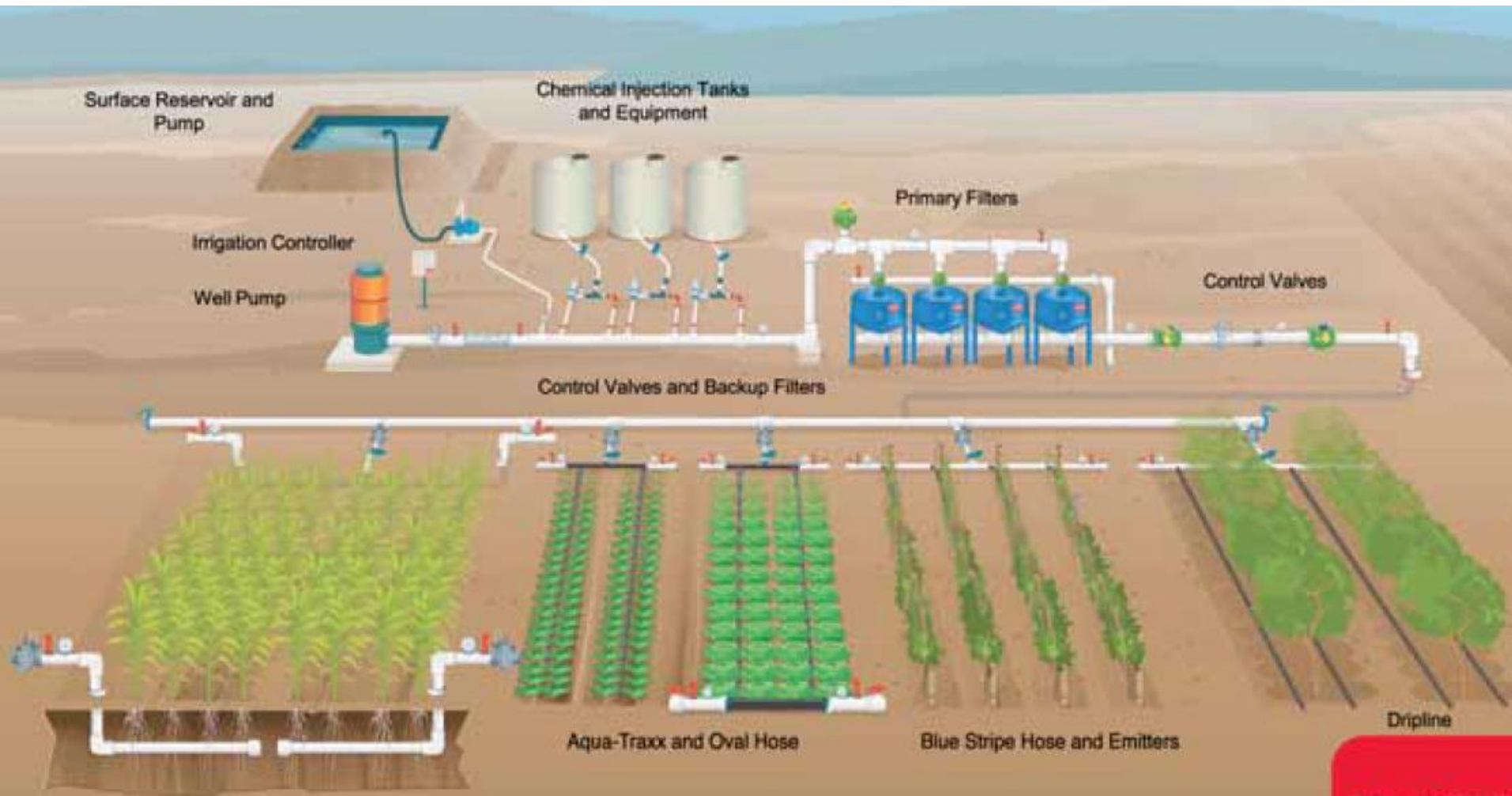
- Point source emitters
- Line source emitter tubing and tapes



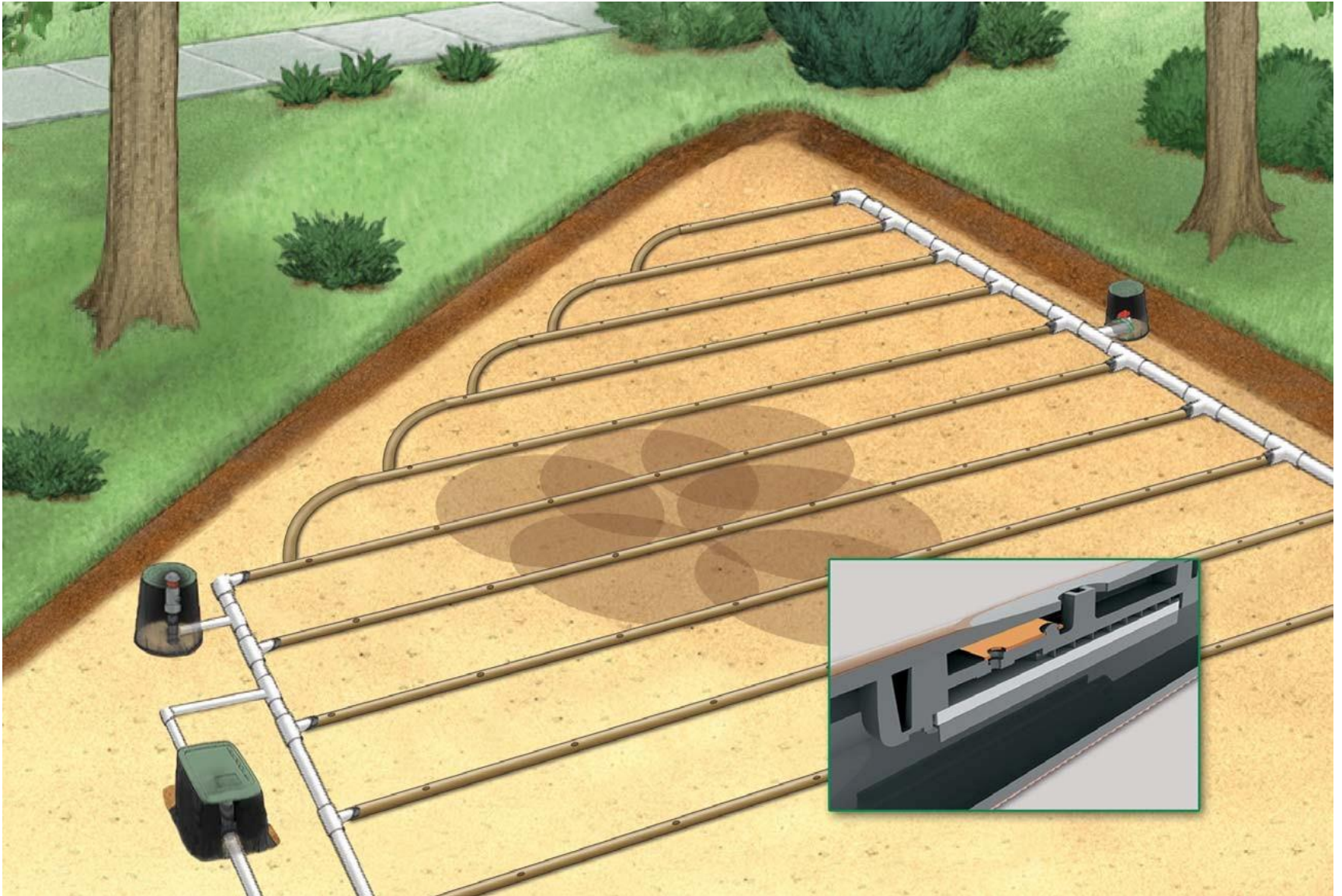
# Typical System Layout



# Typical Drip System Layout



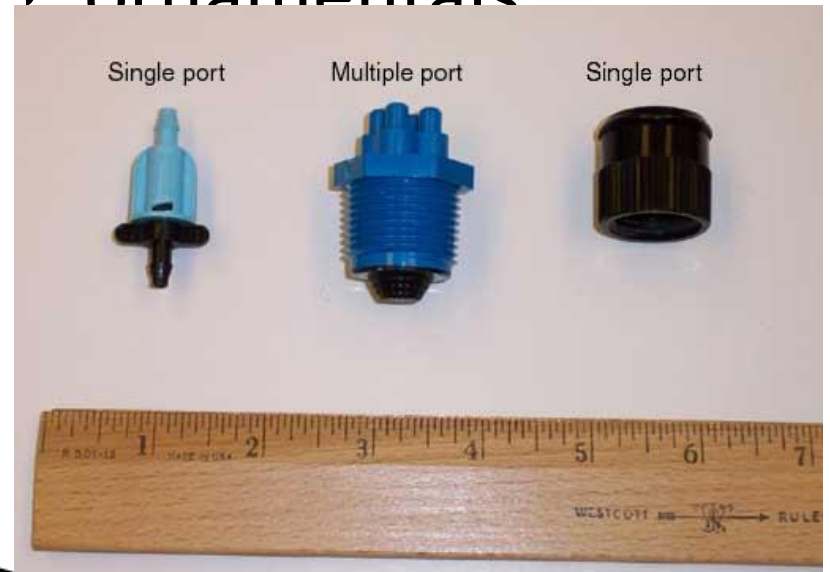
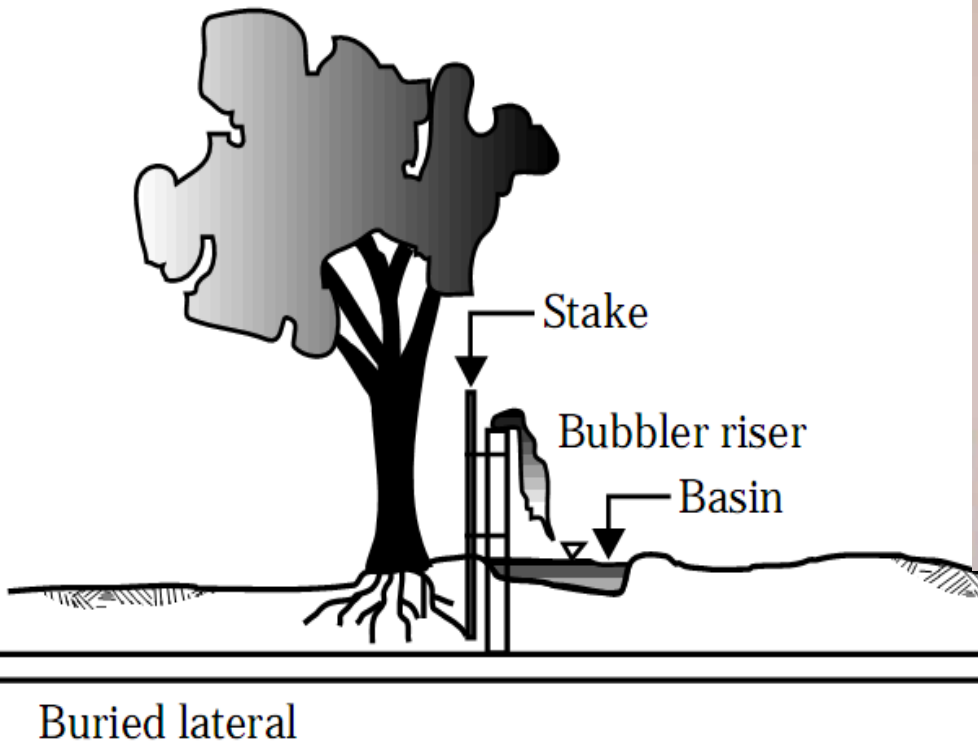
# Subsurface Drip Irrigation



# Basin Bubbler

- Low Pressure: < 5 psi or 3 m of head
- Small diameter tube delivers the water

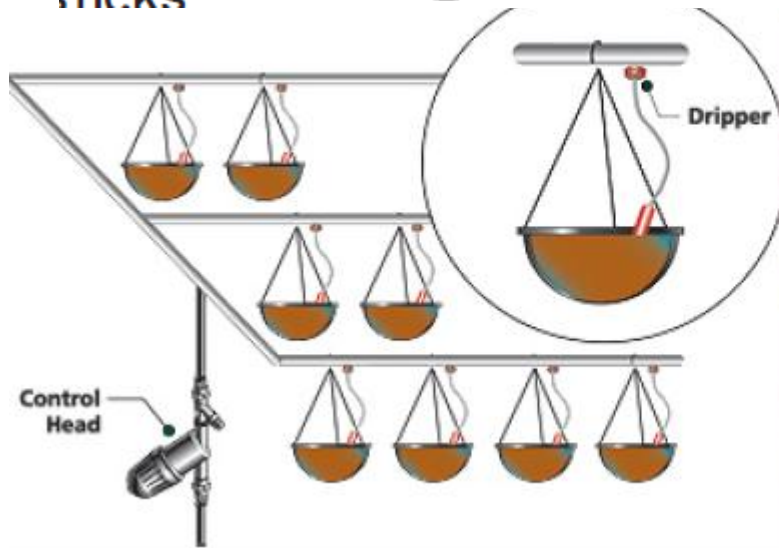
for ornamentals





# Other Types

## MULTI-OUTLET DRIPPERS



# Precision Irrigation



Knowledge and Competence in Areas of Irrigation and Water Management

Smart Controllers:

- Apply water in the right amount and time

Mobile Applications for controlling your system

Wireless Transmittal between soil moisture sensors and Field Controllers



Photo courtesy: Underhill