

Online Training Course on Hydroponics for African Countries

24th – 29th of September, 2021

HYDROPONIC INSTALLATION

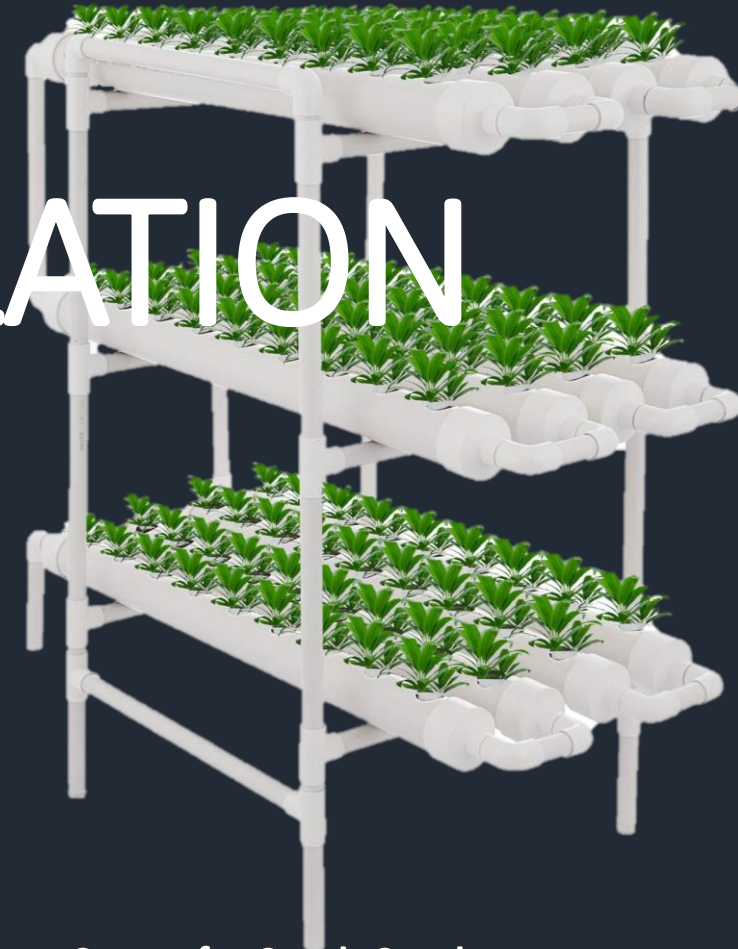
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LEARNING OBJECTIVES

- 1) Participants know and understand the types of hydroponic installations.
- 2) Participants can determine the hydroponic installation according to the type of plant to be cultivated.

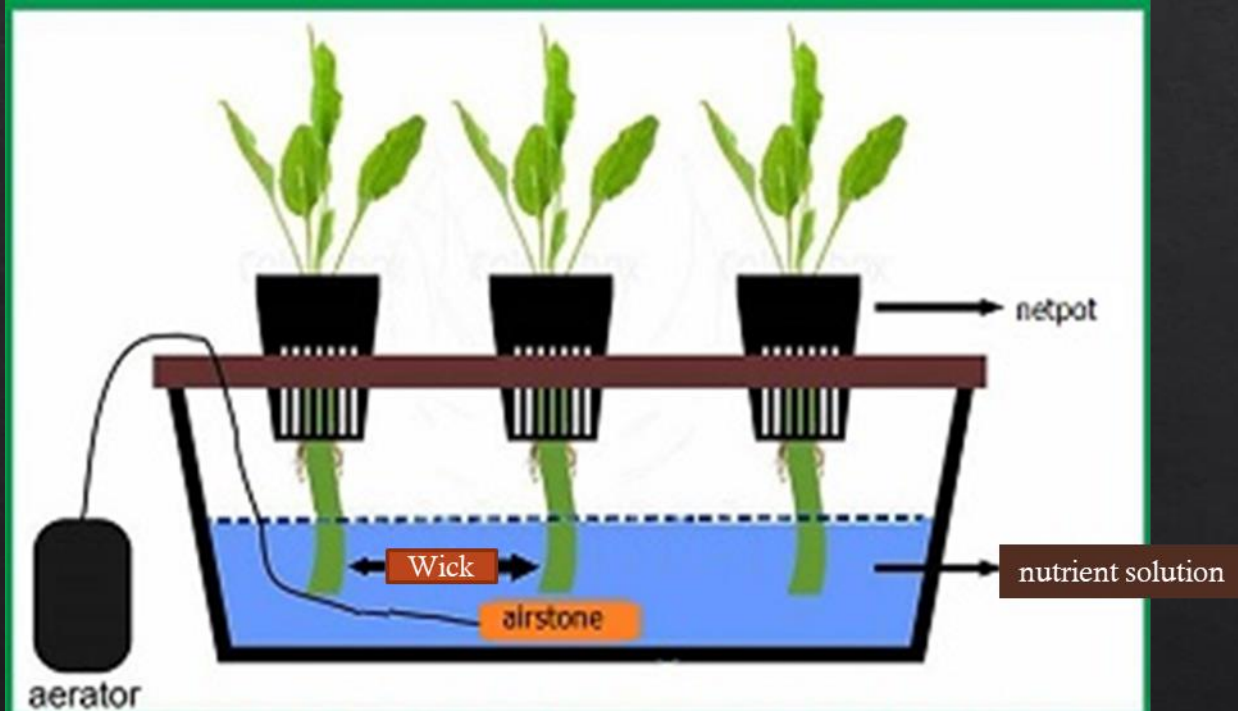




Wick System



- The **simplest system** compared to other systems in hydroponic technology.
- This system simply utilizes the **wick to deliver the nutrient solution** to the root area of the plant.
- This system is also considered the **easiest and cheapest** compared to other systems.
- This system **does not require a water pump** to deliver nutrient solution to the plant root area.



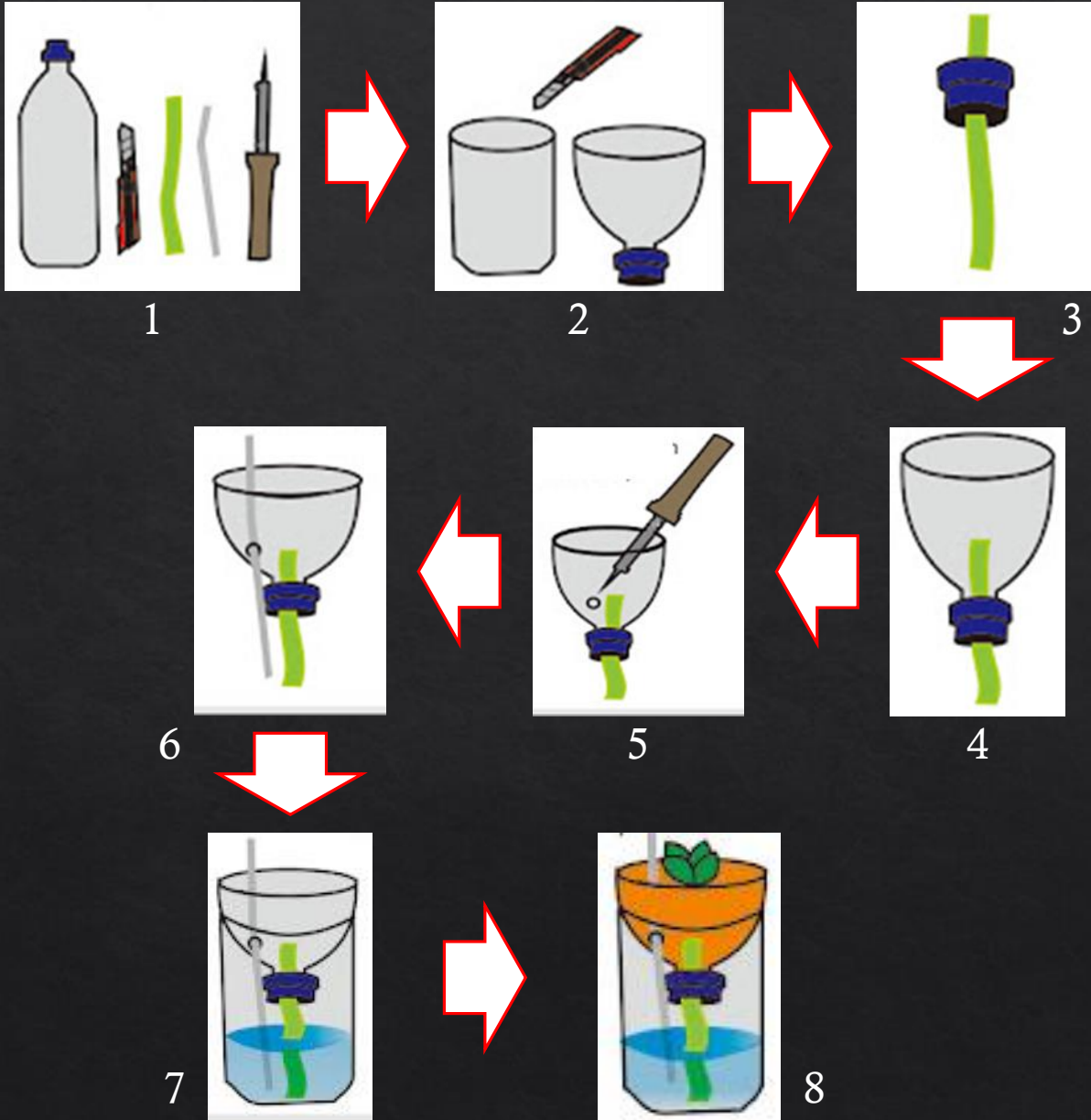
- This system can use electric power or without electricity.
- Electric power is used to turn on the aerator.
- Aerator to produce air in the nutrient solution.
- Air helps make it easier for plant roots to absorb nutrient solution.



- The wick system installation design can be made for only one plant or for more than one plant.
- The single design makes it easy to ensure each plant gets the nutrients it needs.
- The single design is used for fruit vegetable crops, such as tomatoes, chilies, and eggplants.



- Installation design for more than one plant, used for leaf vegetables, such as lettuce, kale, and celery.
- This installation design for more than one plant uses a wider container.
- For leafy vegetables, the wick is used for early plant growth.
- After the roots are elongated, the plant can absorb the nutrient solution without the help of a wick.



- These wick system installation materials can **use the simplest and cheapest materials** to the most expensive materials.
- You can use simple ingredients like mineral water bottles.
- You can make an wick system installation like the picture below.

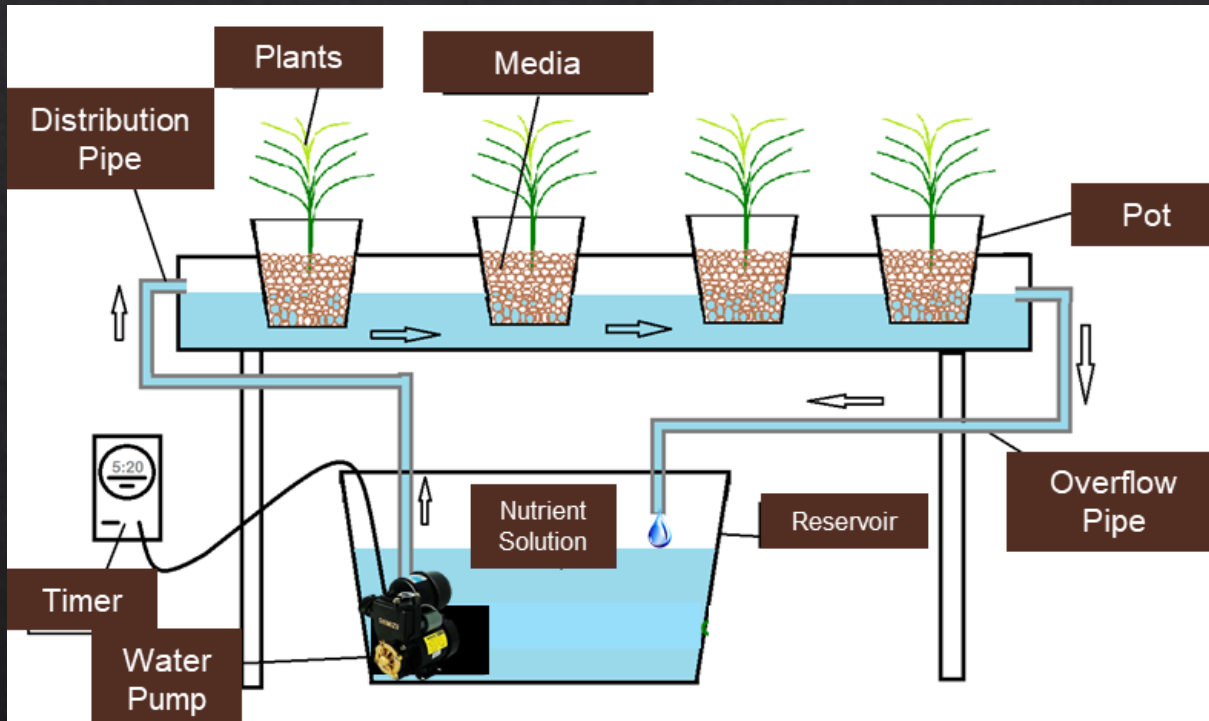


- For an artistic touch, you can use a variety of different materials.
- You can also make an wick system installation with materials like the image below.
- You can use plastic, styrofoam, or other materials.

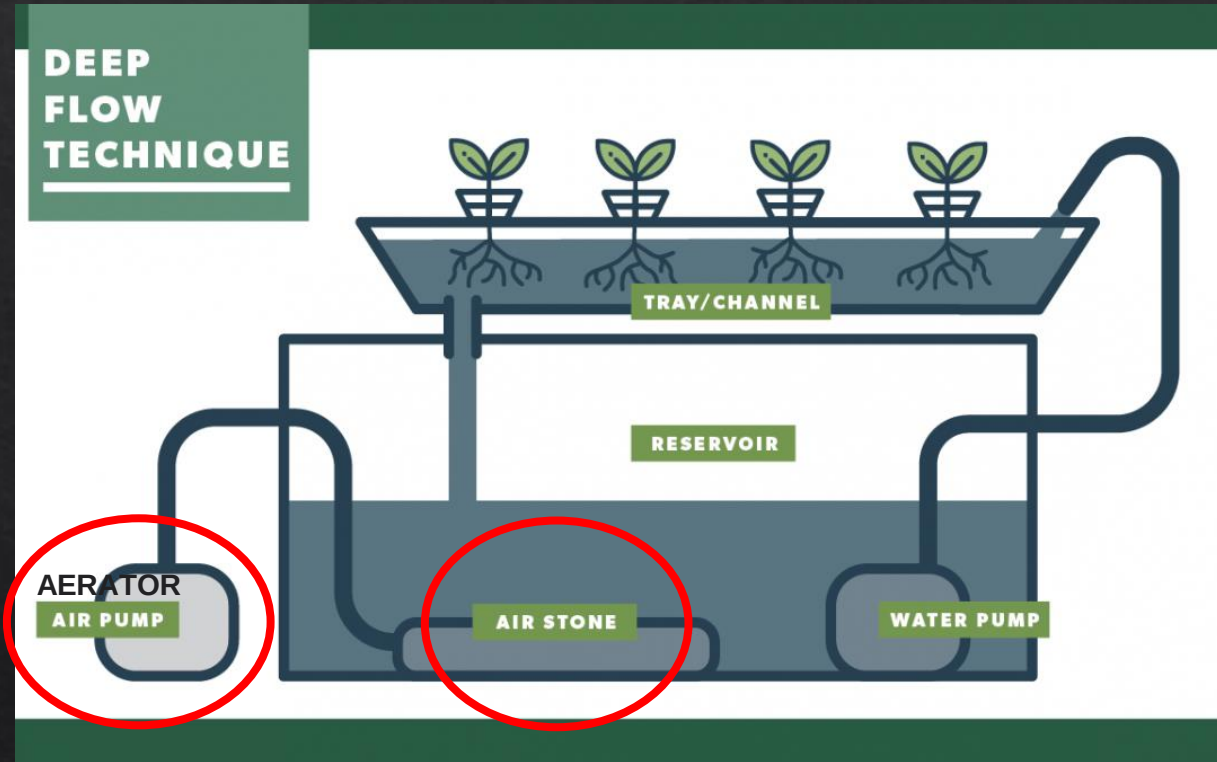




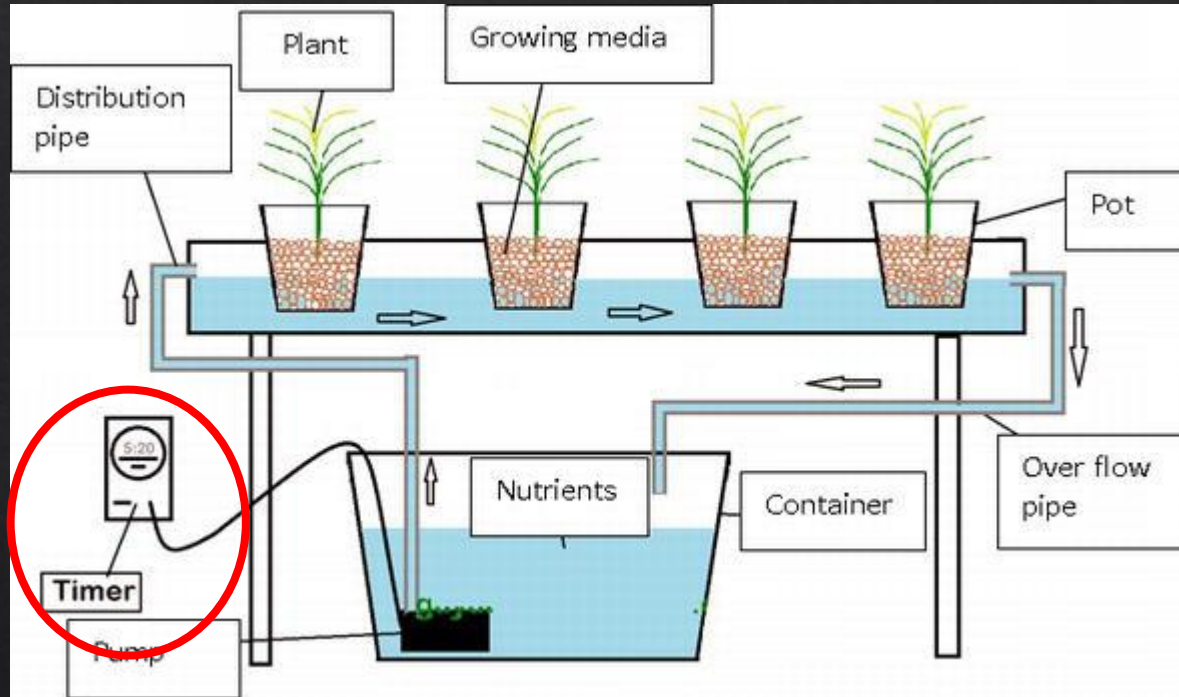
Deep Flow Technique (DFT) System



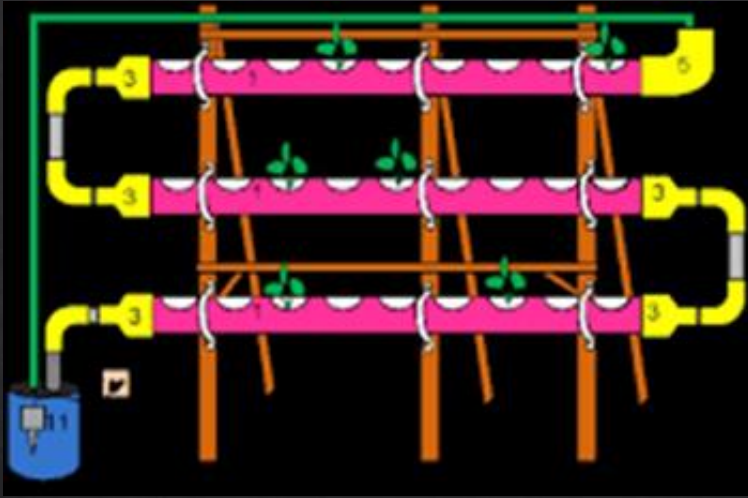
- The DFT system works by **circulating** the nutrient solution to the root area of the plant.
- The nutrient solution is flowed from the reservoir through the root area and back to the reservoir.
- In the root area, the nutrient solution **pools and partially** soaks the plant roots. The nutrient solution is in a flowing state when the pump is running.



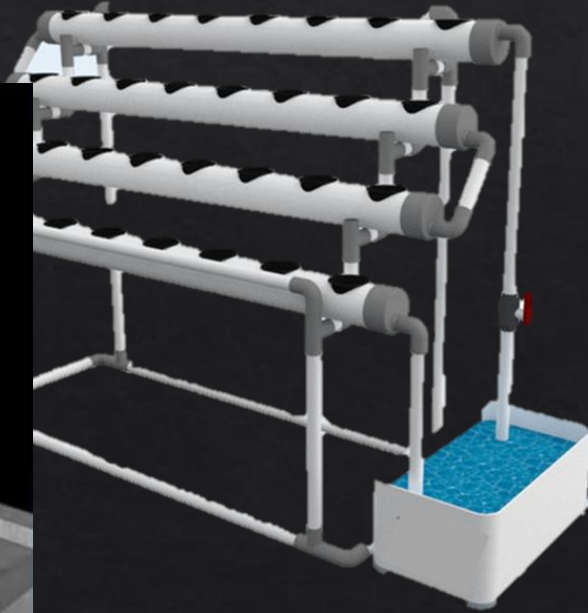
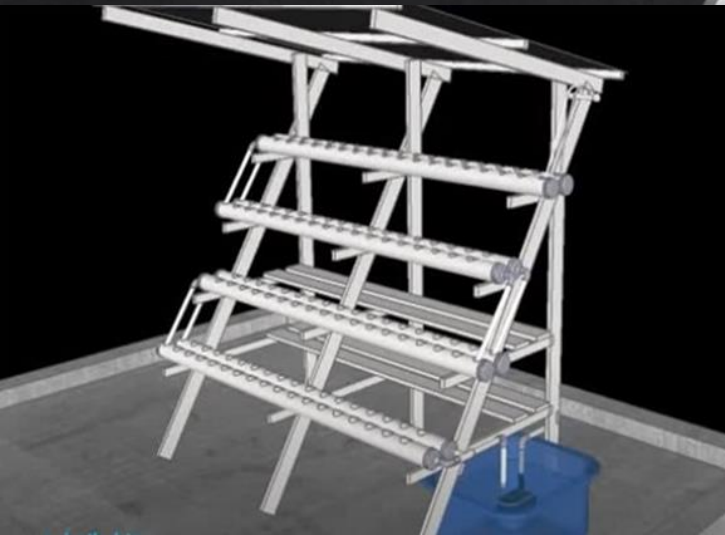
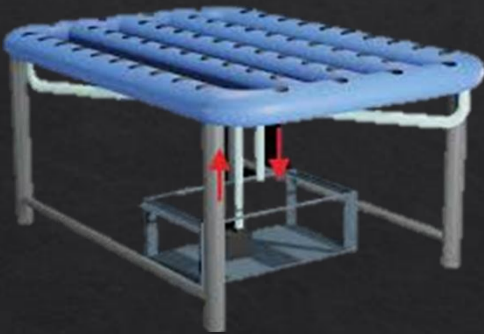
- In some cases, this DFT system uses an **aerator** to produce **sufficient air** in the nutrient solution.
- The availability of **sufficient air** around the roots will make it easier for the roots to **absorb nutrients optimally**.

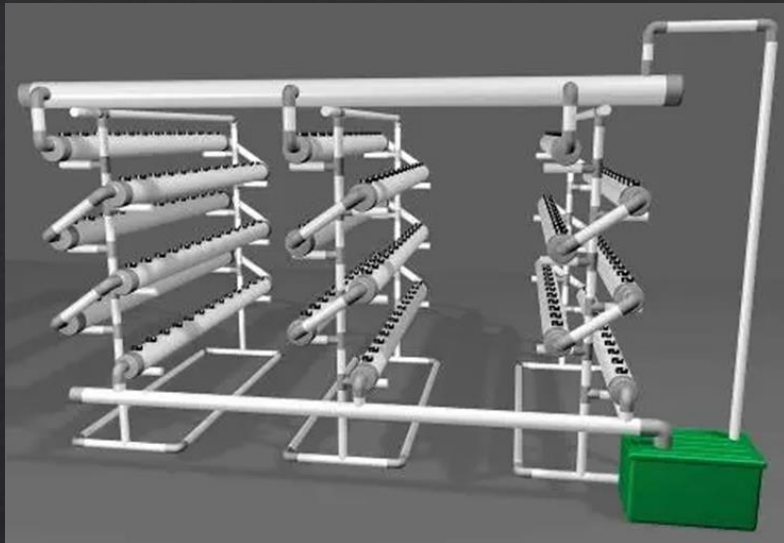


- Sometimes a **timer** is also needed to provide a nutrient solution at **regular intervals**.
- The timer can **save electricity and nutrient solution**, because the pump works to circulate the nutrient solution when needed.
- For example, leafy vegetables do not need nutrients throughout the day (24 hours). The timer helps the pump stop flowing the nutrient solution automatically at night.

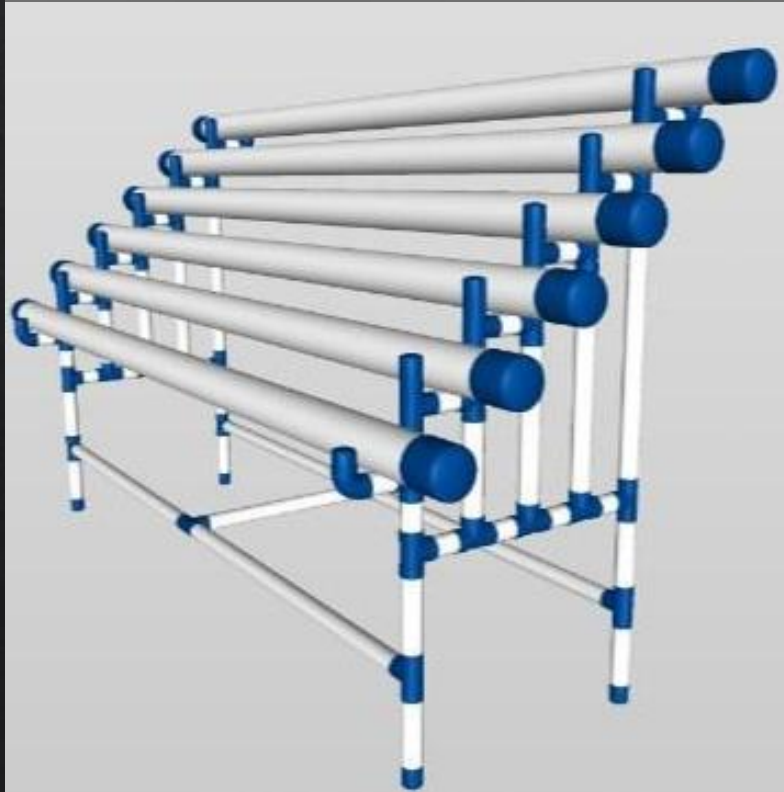
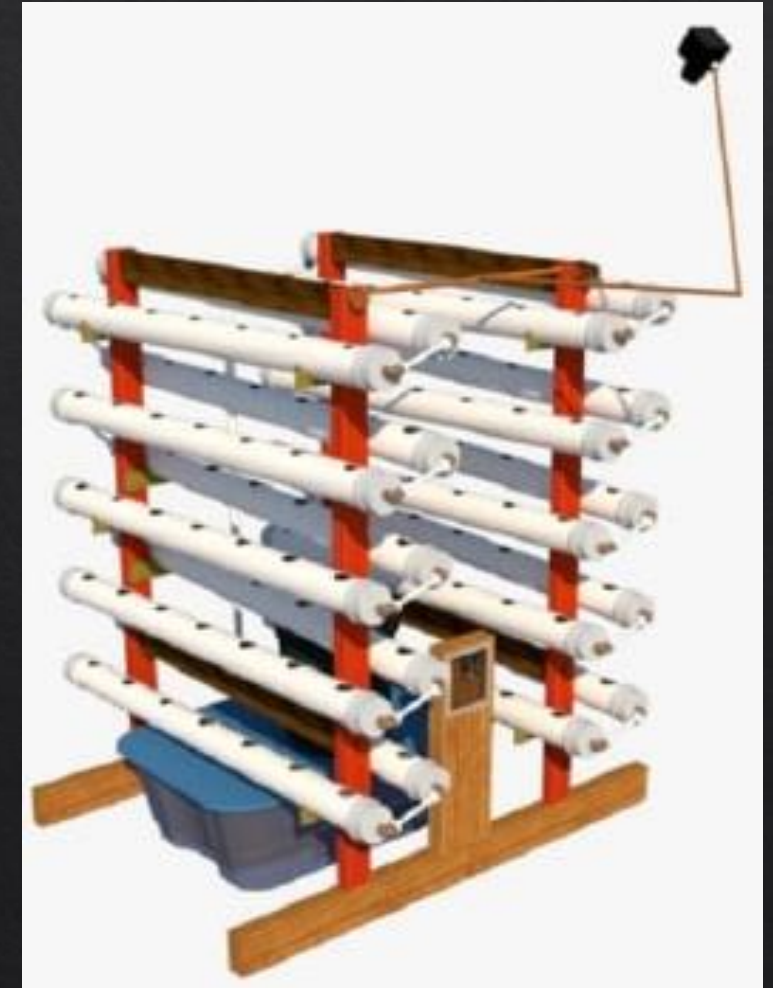
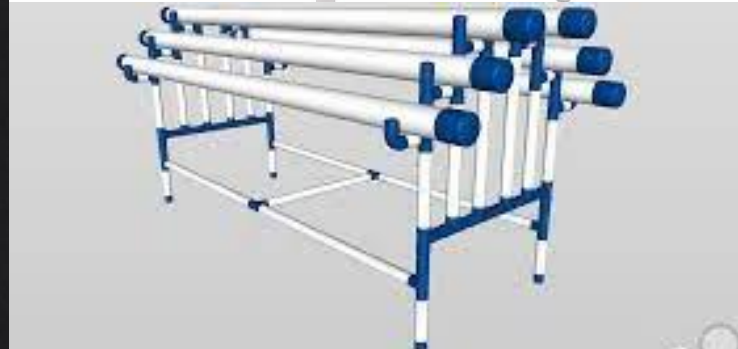


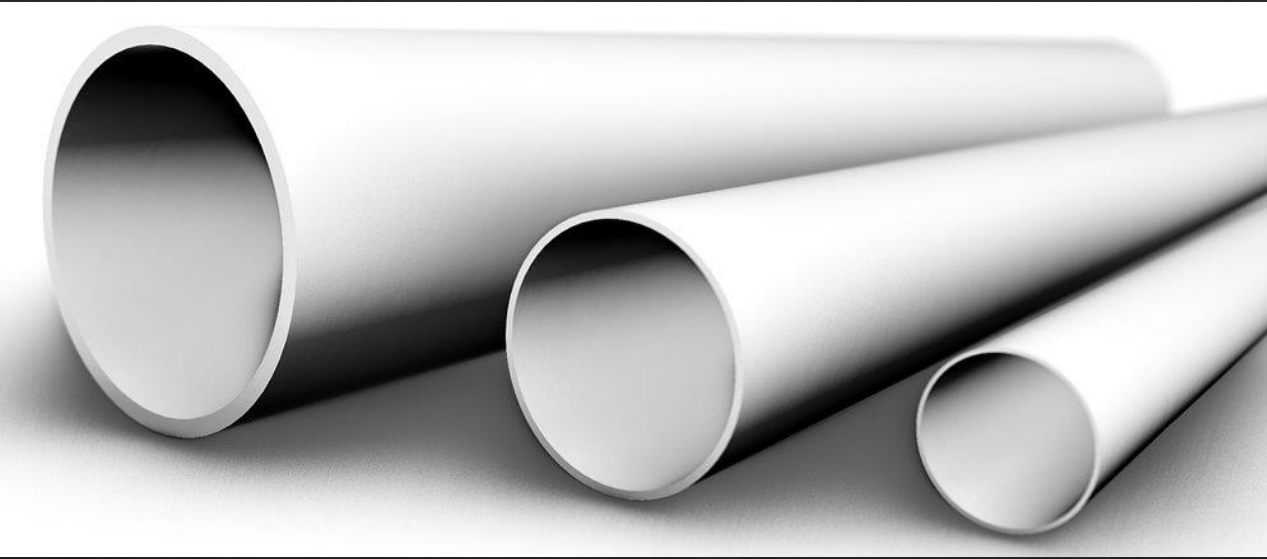
- The DFT system makes it possible to **design various installation models**.
- You will design any kind of DFT system installation design, make sure that the nutrient solution **circulation channel** is **running properly**.





- The following designs can be your inspiration to create a more unique and attractive DFT system installation model.





- In general, the **material** used to make the installation of a DFT system is **paralon pipe**.
- Be careful with paralon pipes that contain **lead**, because it will **affect the nutrient solution**.
- Use **light colored** paralon pipes, **dark colored** pipes will absorb heat, and heat will **affect the nutrient solution**.



➤ There are several pump options that can be used for DFT systems.

➤ The DFT system does not require a large water pump.

➤ The choice of pump is adjusted to the height of the installation design and volume of nutrient solution.

➤ In Indonesia, this pumps are available from thrust at a height of 1 meter to 5 meters, and a solution volume of 800 liters per hour up to 5000 liters per hour.

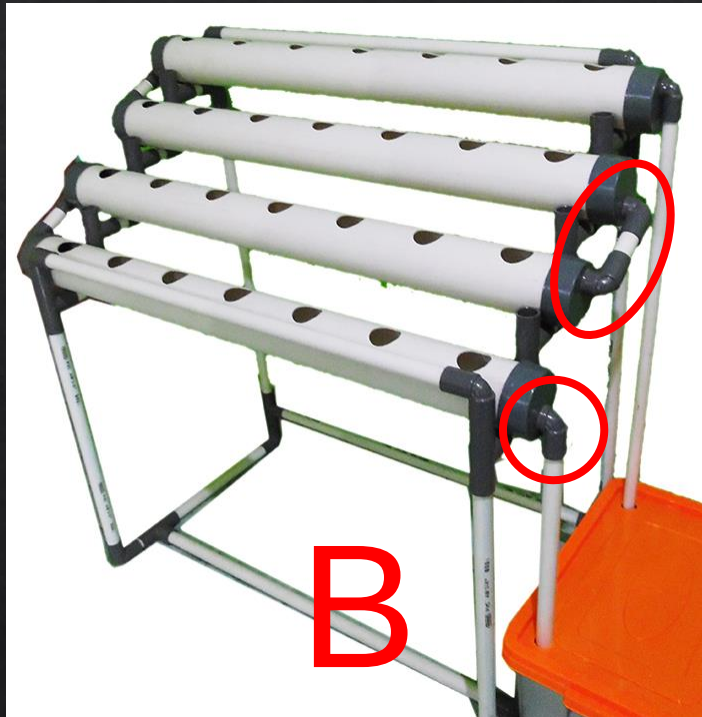
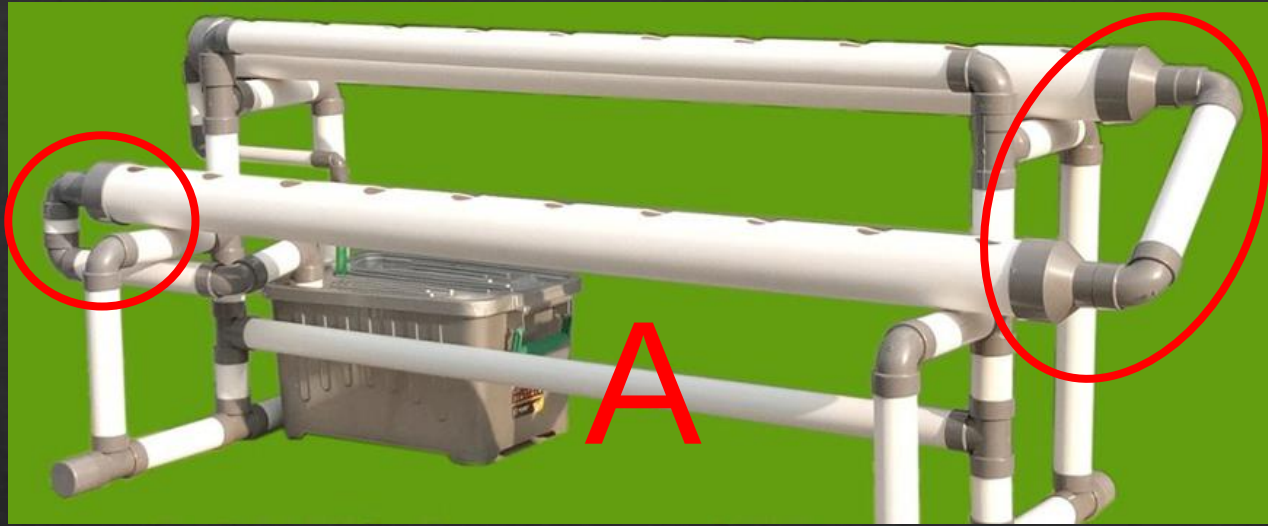




- It is important to filter the nutrient solution before it is sent to the DFT installation to keep the nutrient solution clean and easily absorbed by plant roots.
- Some hydroponic pump products are already available with a filter.



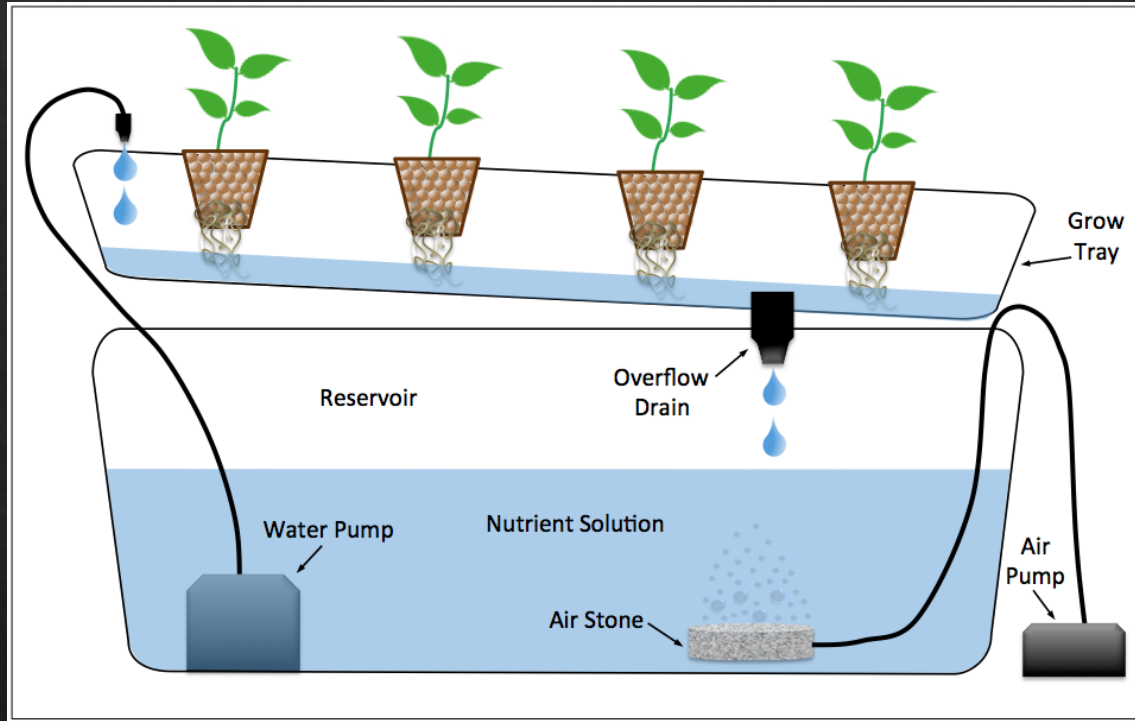
- It is important to note in the selection of connections between paralon pipes.
- Improper pipe connection will cause the circulation of nutrient solution is not smooth.



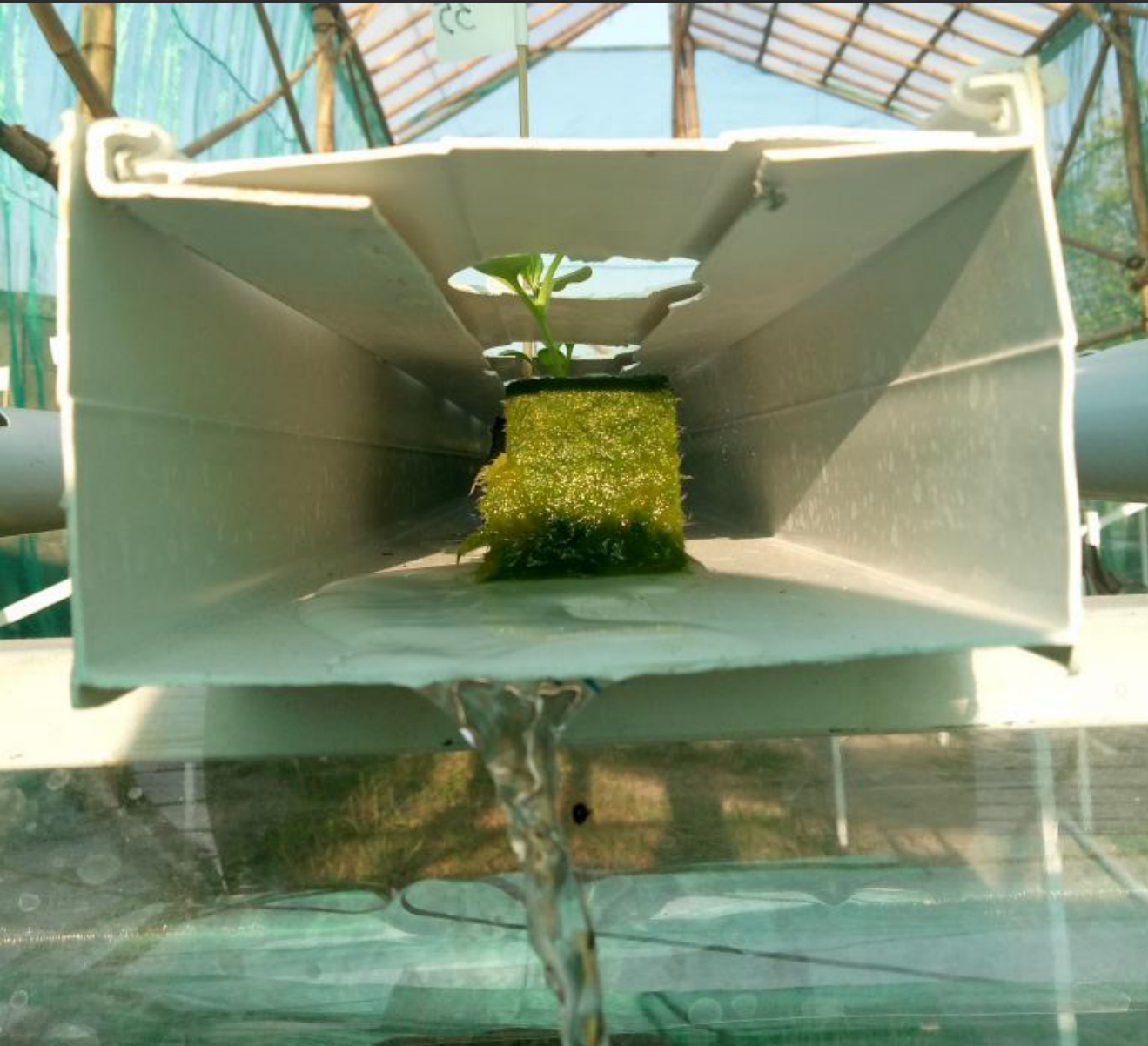
- The two examples of images below are 2 different models of connections between paralons.
- Figure A allows for a smoother circulation of the nutrient solution than Figure B.



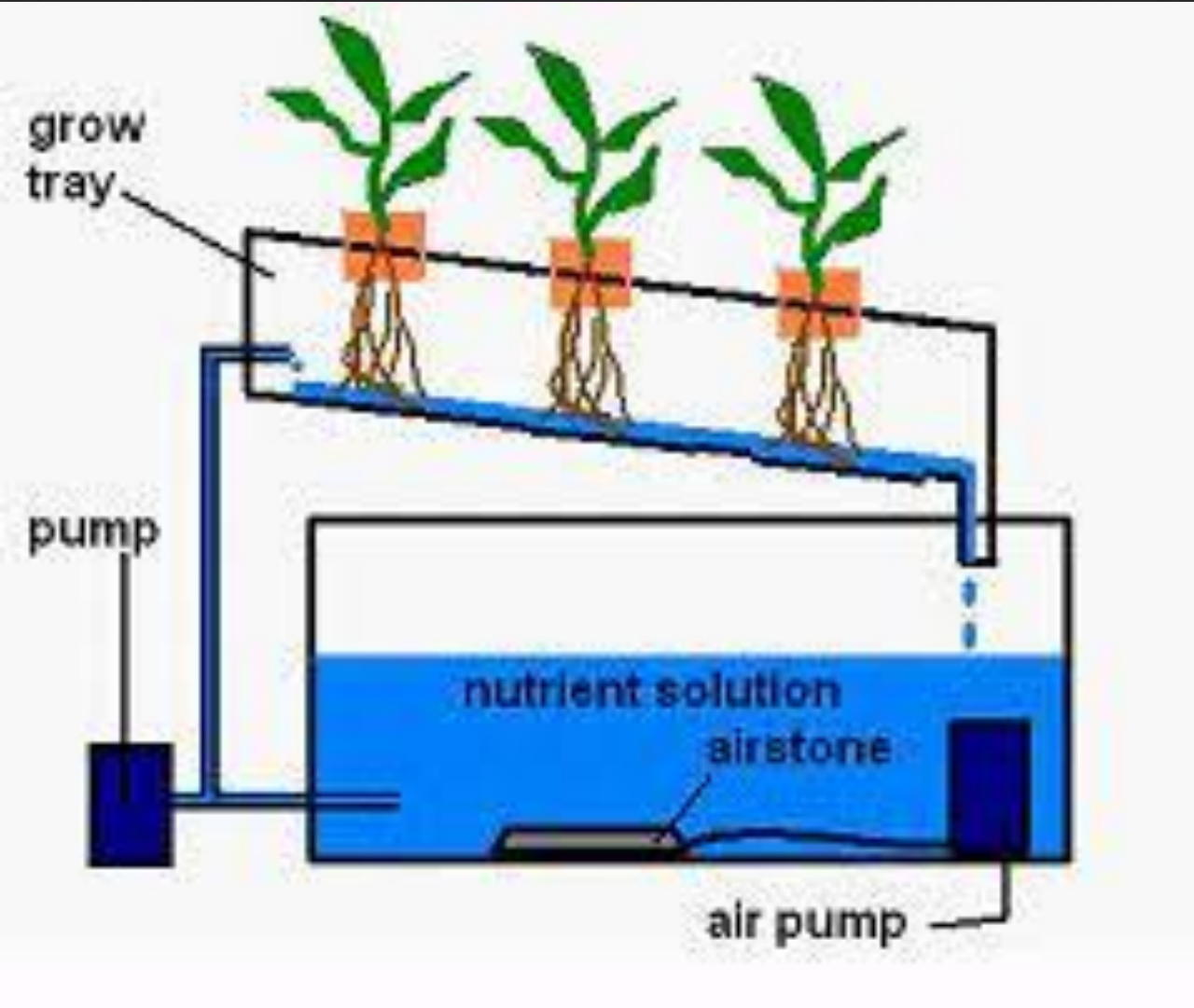
Nutrient Film Technique (NFT) System



- Like the DFT system, the NFT system is a hydroponic system that utilizes the circulation of nutrient solution from the reservoir to the plant roots and back to the reservoir.
- The difference between DFT and NFT systems is the installation surface where the roots absorb the nutrient solution.



- The surface of the NFT system installation is fed with a very thin nutrient solution, the nutrient solution passes through the plant roots without inundating them.
- At the time of early plant growth, the nutrient solution is absorbed by rockwool and flowed to the plant roots.



- As in the DFT system, the NFT system also requires an aerator (air pump) in its working system.
- The NFT system does not need a timer in its working system, because the NFT system works all day (24 hours).
- The supply of nutrients to plant roots automatically stops when the system stops working.



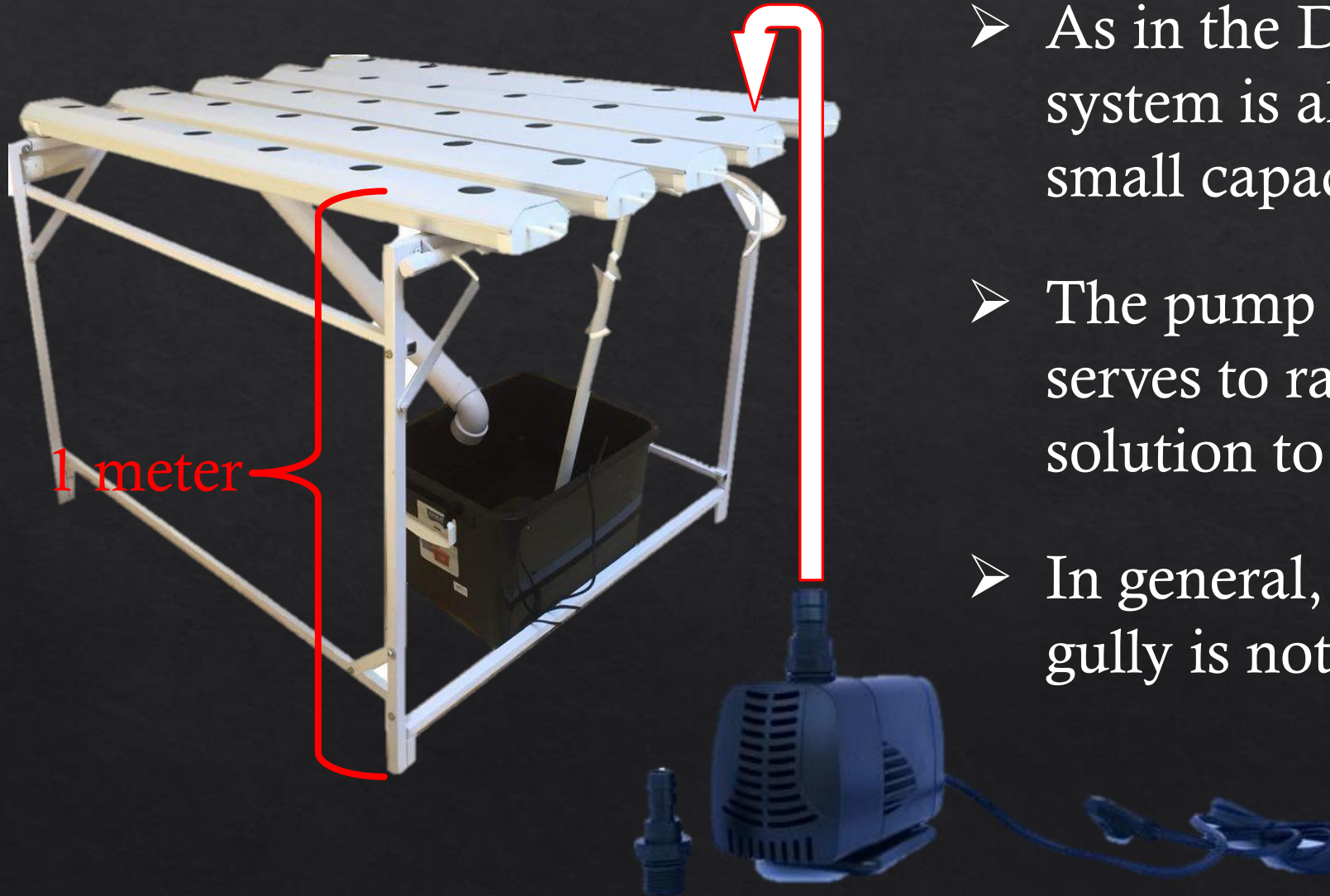
- The installation design of the NFT system is not as varied as that of the DFT system.
- The installation design of the NFT system is mostly as shown in the picture below.





- The installation material for the NFT system is gully.
- This material allows the nutrient solution to flow thin evenly.





- As in the DFT system, the NFT system is also sufficient to use a small capacity pump.
- The pump power needed only serves to raise the nutrient solution to the gully.
- In general, the height of the gully is not more than 1 meter.



- The NFT system also requires a filter.
- Dirt mixed with the nutrient solution can prevent the nutrient solution from being absorbed by plant roots optimally.



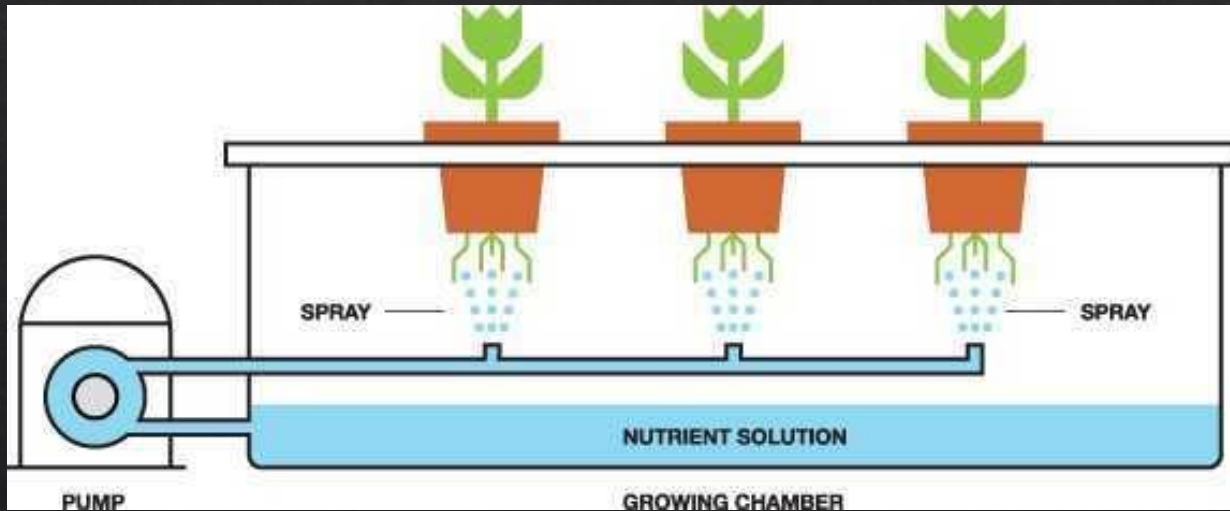
- It is important to pay attention to the design of the distribution channel for the nutrient solution.



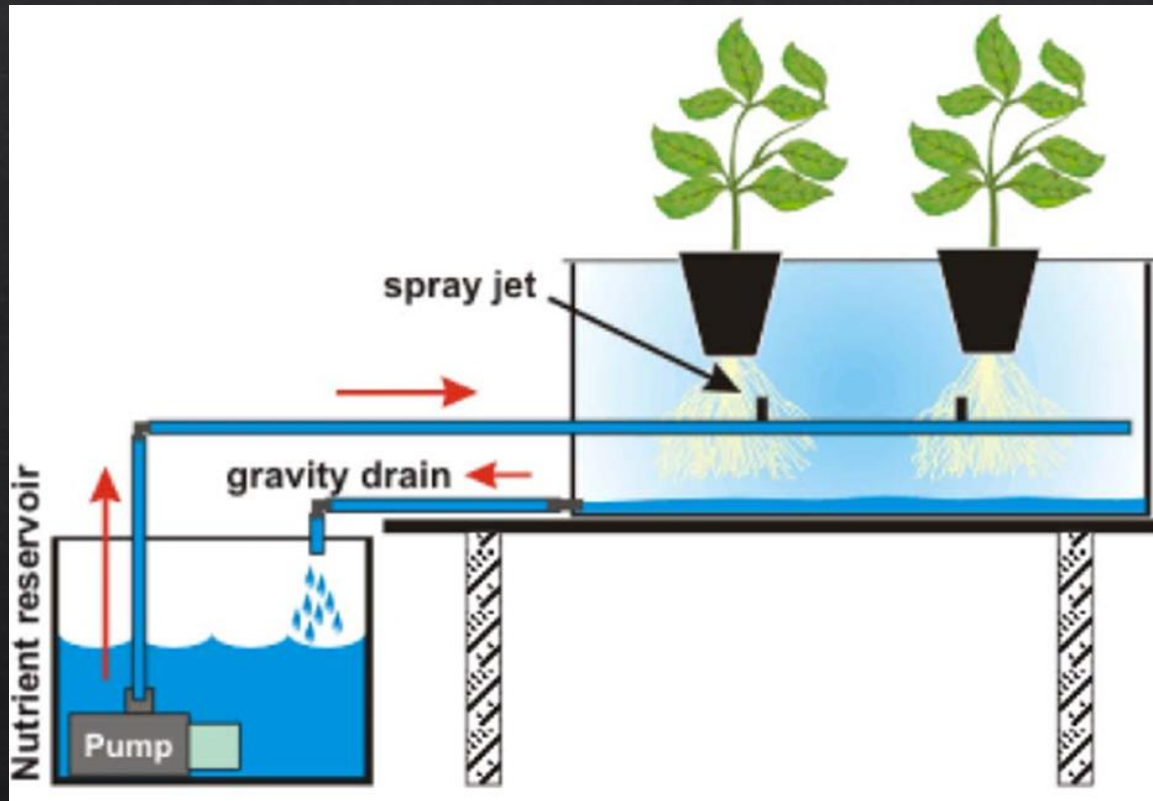
- Please pay attention to the picture. The design A nutrient solution distribution channel is easier to clean than design B.



Aeroponic System



- Aeroponics is a system in which the roots are periodically moistened with fine droplets of nutrient solution (like a mist).
- Aeroponics work system is to circulate the nutrient solution by misting it into the root area of the plant.
- Fine mist spray makes it easier for plant roots to absorb nutrient solution more optimally.



- The particle size of the water in the spray is 30-50 microns and the discharge is 1.5 ml/second.
- It takes a mist sprayer with a maximum outlet of 0.8 mm and a pressure of 60 to 80 Psi to produce water particles measuring 30 to 50 microns.

- The following are some of the components needed in the manufacture of an aeroponics installation:



- 1) **Closed Container:** a place to grow plant roots and tubers, a nozzle, a nutrient solution channel, an opaque place. The container material is fiberglass.



- The following are some of the components needed in the manufacture of an aeroponics installation:



- 2) **Pressure Booster Pump Reverse Osmosis:** pull the nutrient solution and push it into the pressure tank membrane.

- The following are some of the components needed in the manufacture of an aeroponics installation:



- 3) **Pressure Tank Membrane:**
collects the pressure generated by the RO pump and sprays the nutrient solution into the aeroponics installation channel.

- The following are some of the components needed in the manufacture of an aeroponics installation:



- 4) **High Pressure Switch:**
set the pump on and off
based on pressure.



- The following are some of the components needed in the manufacture of an aeroponics installation:



5) **Cycle Timer:**
regulates the
frequency of
distribution of
nutrient solutions.



- The following are some of the components needed in the manufacture of an aeroponics installation:

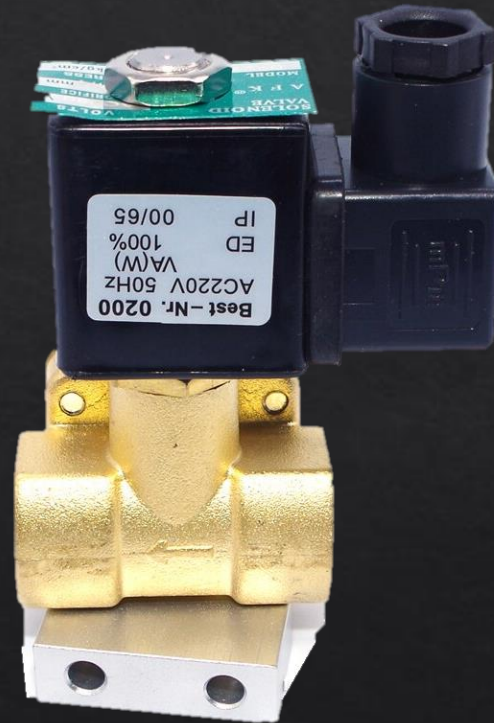
- The following are some of the components needed in the manufacture of an aeroponics installation:



- 7) **Nozzle Mist Sprayer (Mist Jet Sprinkle):**
create a nutrient solution in the form of a mist.



- The following are some of the components needed in the manufacture of an aeroponics installation:



- 8) **Solenoid Valve:**
automatically adjust
the volume of the
nutrient solution
when it flows into the
installation channel.

- The following are some of the components needed in the manufacture of an aeroponics installation:



- 9) **Disc Filter**: filter dirt to prevent the system from clogging.

- The following are some of the components needed in the manufacture of an aeroponics installation:



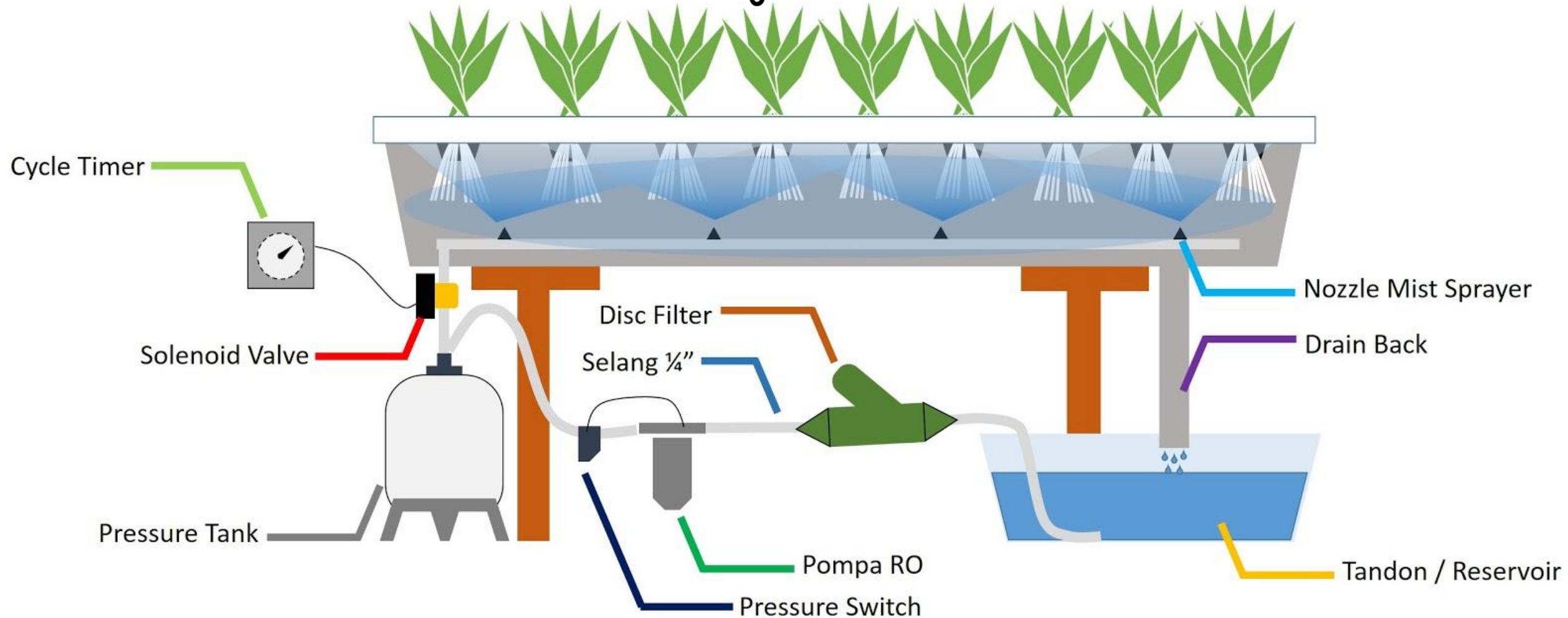
9) **Reservoir:**
a place to
hold
nutrient
solution.

- The following are some of the components needed in the manufacture of an aeroponics installation:



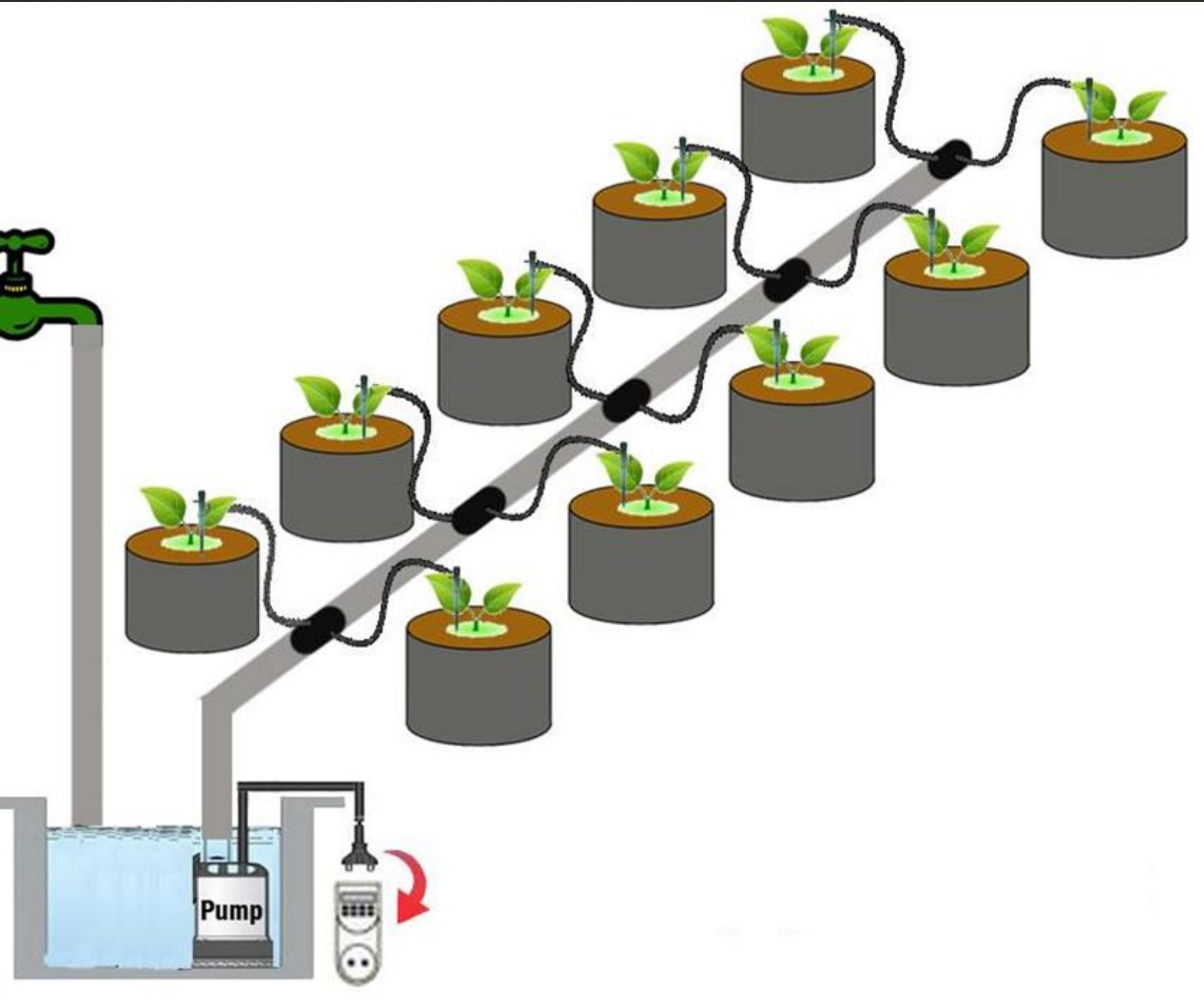
- 9) **Hose Adapter (connector):**
hose connector with filter disc.

The following is a complete aeroponics installation





Drip Irrigation System



- Drip irrigation systems work by flowing a nutrient solution drop by drop to each plant.
- This system is called the most water efficient system.
- This system can be used for pure hydroponic technology and for cultivating plants with soil media.



- Provision of irrigation water in drip irrigation is given directly around the root area.
- This system is not a circulation system, the water that has flowed to the plants is not returned to the reservoir.



Components of Drip Irrigation System Installation



- 1) **Water Source:**
it can be an
ecobulk
reservoir or a
pond and
others.



Components of Drip Irrigation System Installation

2) **Water Pump:**
pulling and pushing water.



Components of Drip Irrigation System Installation

3) Bypass Valve:

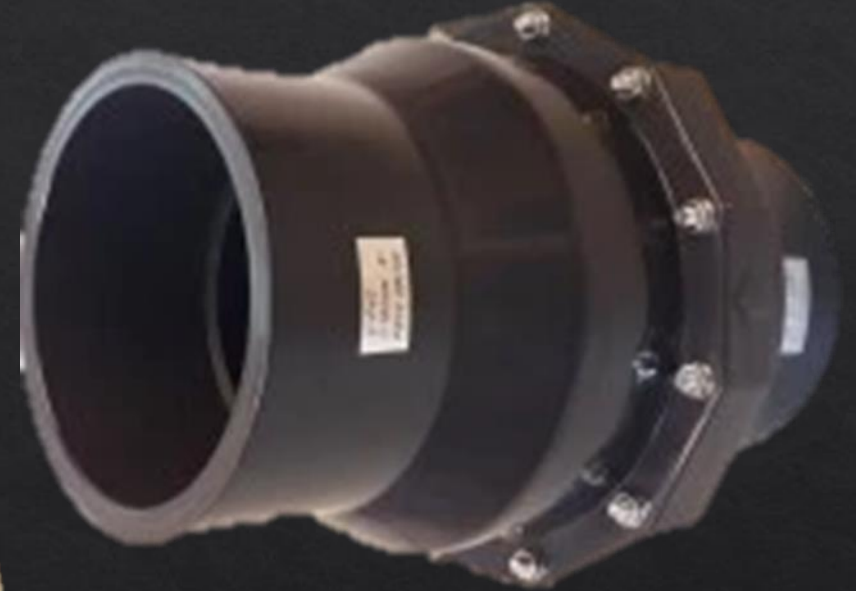
regulate, control and direct the flow of water by opening, closing or partially closing the water flow.

It has manual and automatic.



Components of Drip Irrigation System Installation

4) **Non Return Valve (NRV):**
prevent backflow.



Components of Drip Irrigation System Installation

- 5) Hydro Cyclone Sand Separators:
Separate dirt from water.



Components of Drip Irrigation System Installation

- 6) **Ventury:**
produce air bubbles (oxygen)
in the solution.



Components of Drip Irrigation System Installation

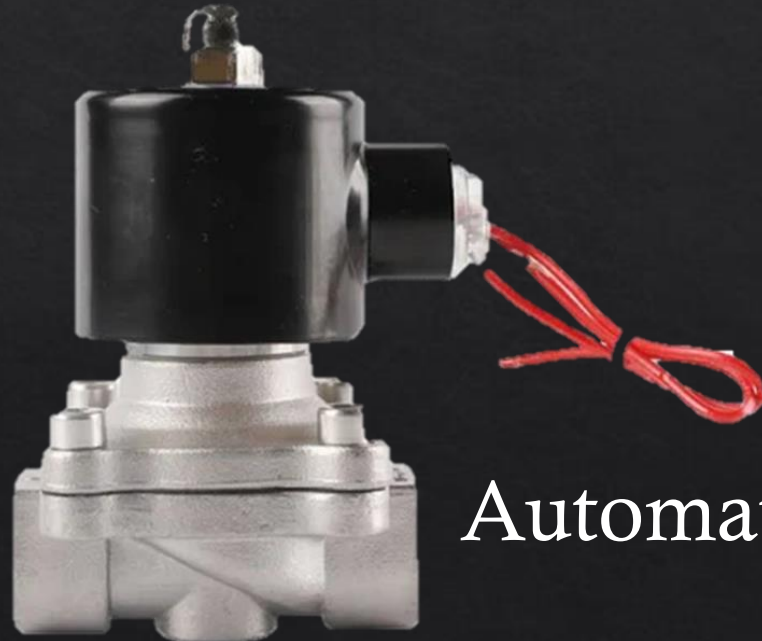
- 7) **Pressure Gauge:**
Measuring pressure.



Components of Drip Irrigation System Installation

8) Back Wash Valve:

wash the filter media without having to remove the filter media from the tube.



Automatic



Manual

Components of Drip Irrigation System Installation

9) Sand Filter:

removes turbidity in water and cleans water from insoluble particles so that the water becomes clearer.



Components of Drip Irrigation System Installation

- 10) **Screen Filter:**
filter water
impurities before
being distributed
to plants.



Components of Drip Irrigation System Installation

- 11) **Air Vent Valve:**
entering and removing
air in the water line,
and adjusting the flow
or volume of water.



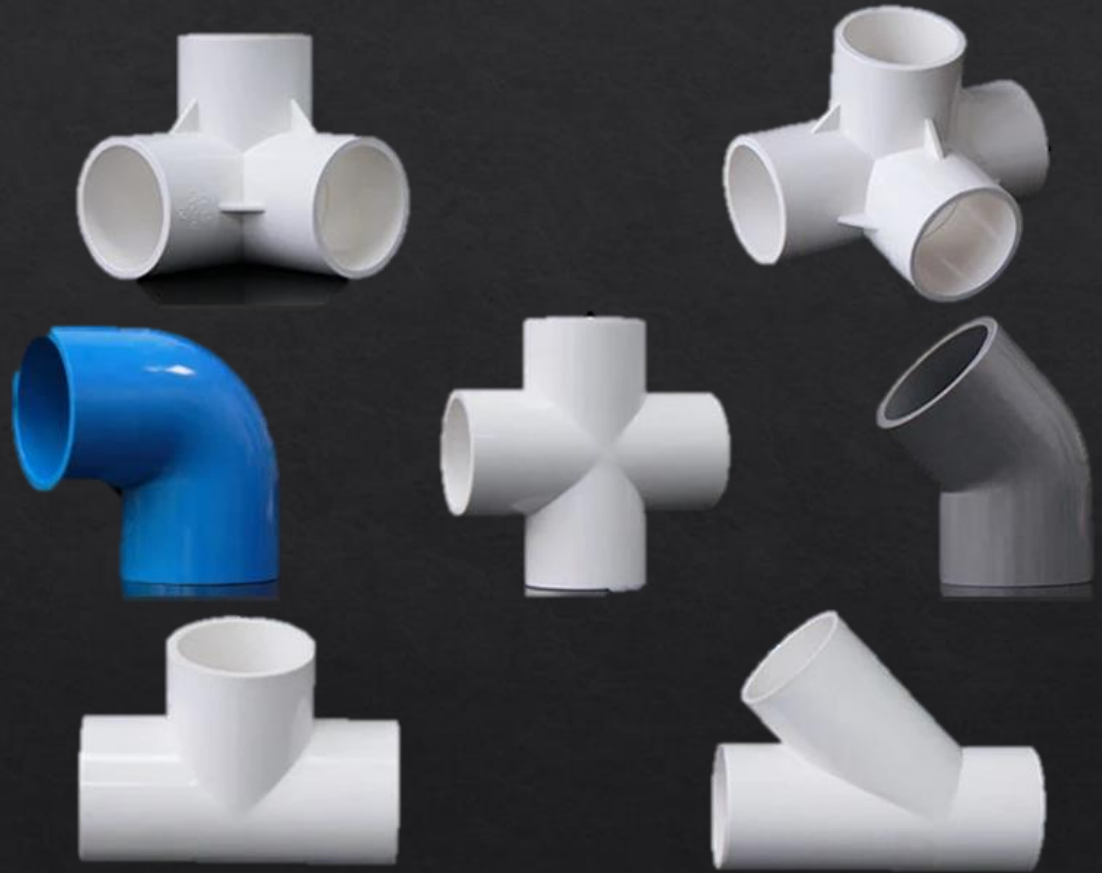
Components of Drip Irrigation System Installation

- 12) **Ball Valve:**
to open and close the
water flow manually.



Components of Drip Irrigation System Installation

13) **Pipe Connection:**
connecting the
installation pipes
according to the
required design.



Components of Drip Irrigation System Installation

- 14) **Flush Valve:**
cleaning and disposing of
dirt in irrigation canals.



Components of Drip Irrigation System Installation

15) Watermur:

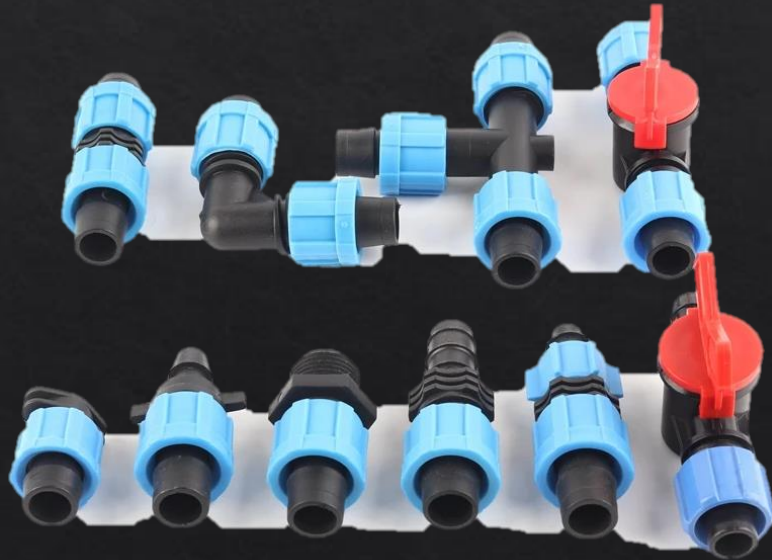
Non-permanent pipe fittings, which can be removed and reassembled.



Components of Drip Irrigation System Installation

16) **Start Connector:**

The connection between the PVC pipe and the drip pipe (drip hose).



Components of Drip Irrigation System Installation

17) **PVC Pipe or PE Hose or RO Hose:**
as the main irrigation channel.



PVC Pipe



PE Hose



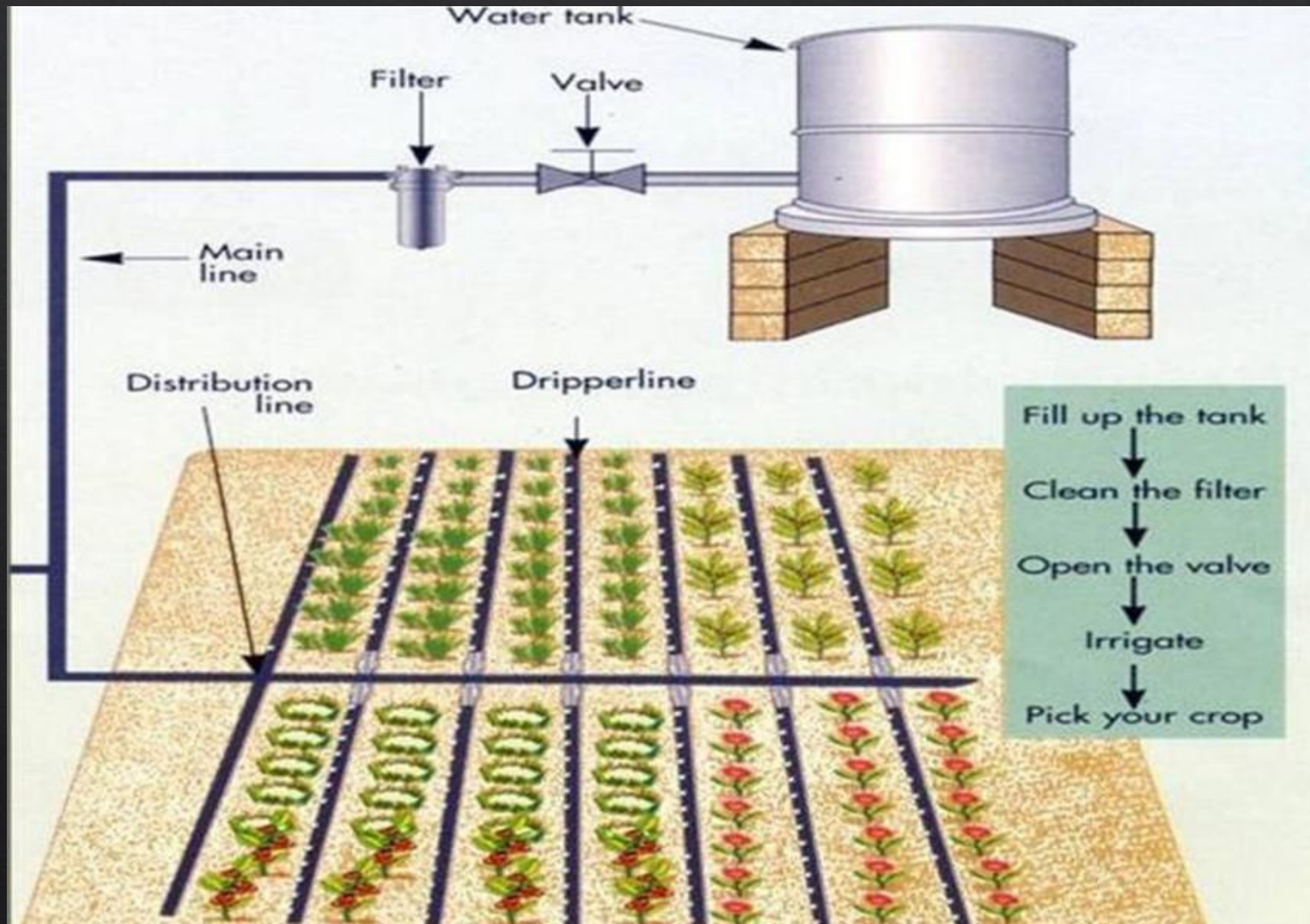
RO Hose

Components of Drip Irrigation System Installation

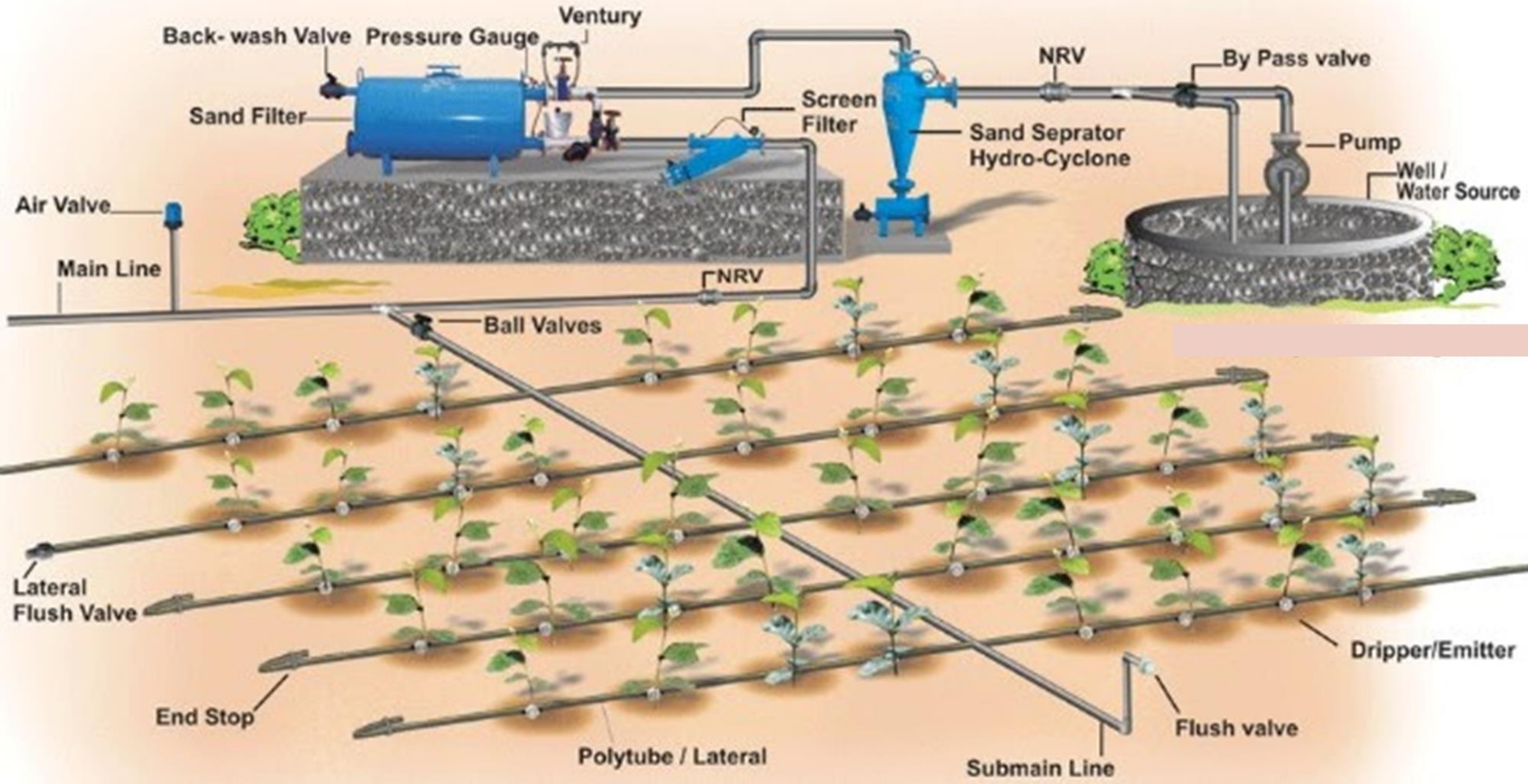
- 18) **Control Stick:**
regulate the volume of water
that drips to the plant roots.



SIMPLE DESIGN OF DRIP IRRIGATION SYSTEM



COMPLETE DESIGN OF DRIP IRRIGATION SYSTEM



Thank You

