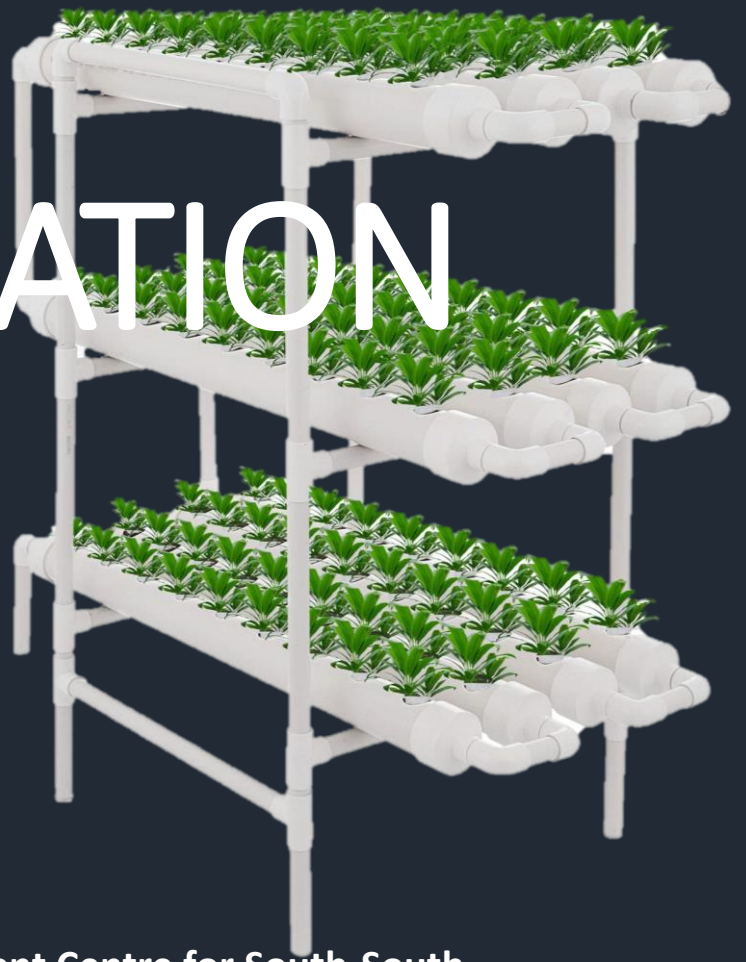
Online Training Course on Hydroponics for African Countries

24th - 29th of September, 2021

HYDROPONIC INSTALLATION



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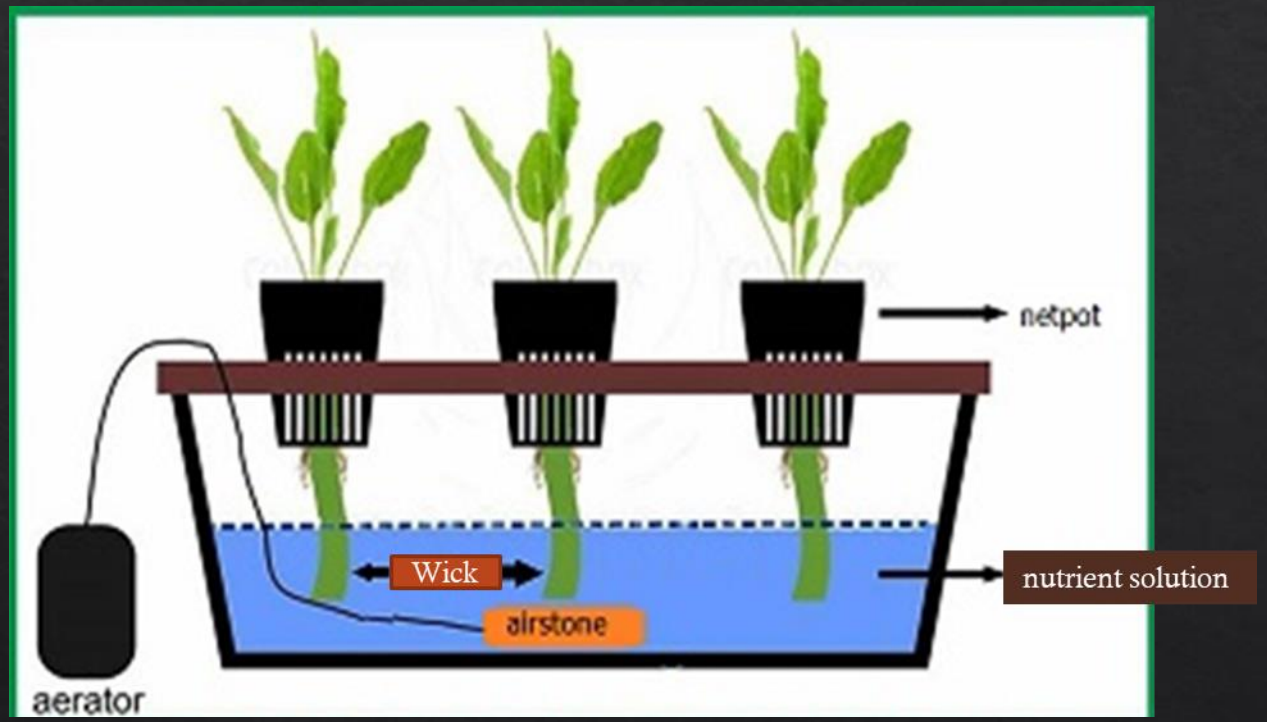
LEARNING OBJECTIVES

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

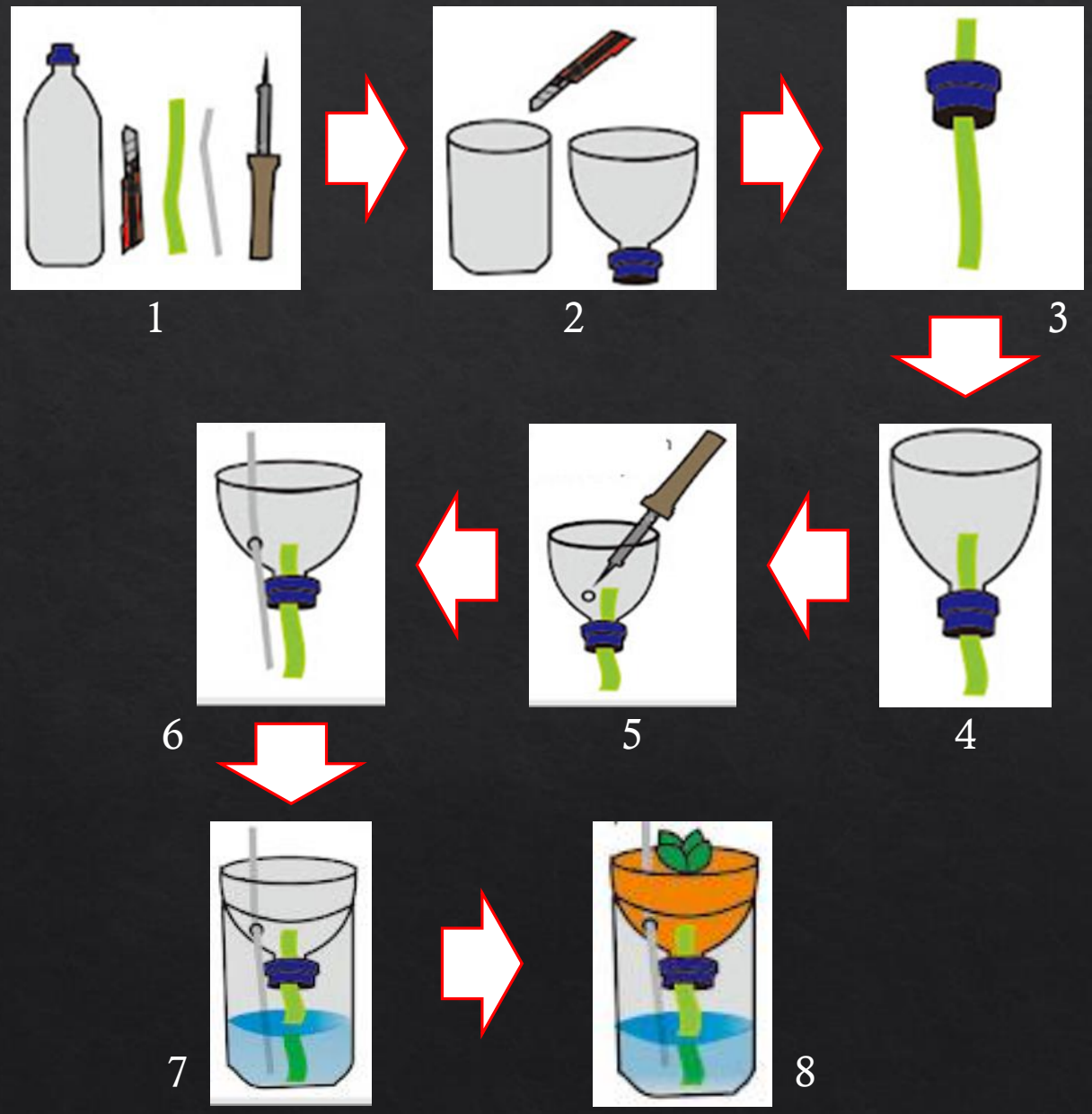
- The simplest system compared to other systems in hydroponic technology.
- This system simply utilizes the wick to deliver the nutrient solution to the root area of the plant.
- This system is also considered the easiest and cheapest compared to other systems.
- This system does not require a water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

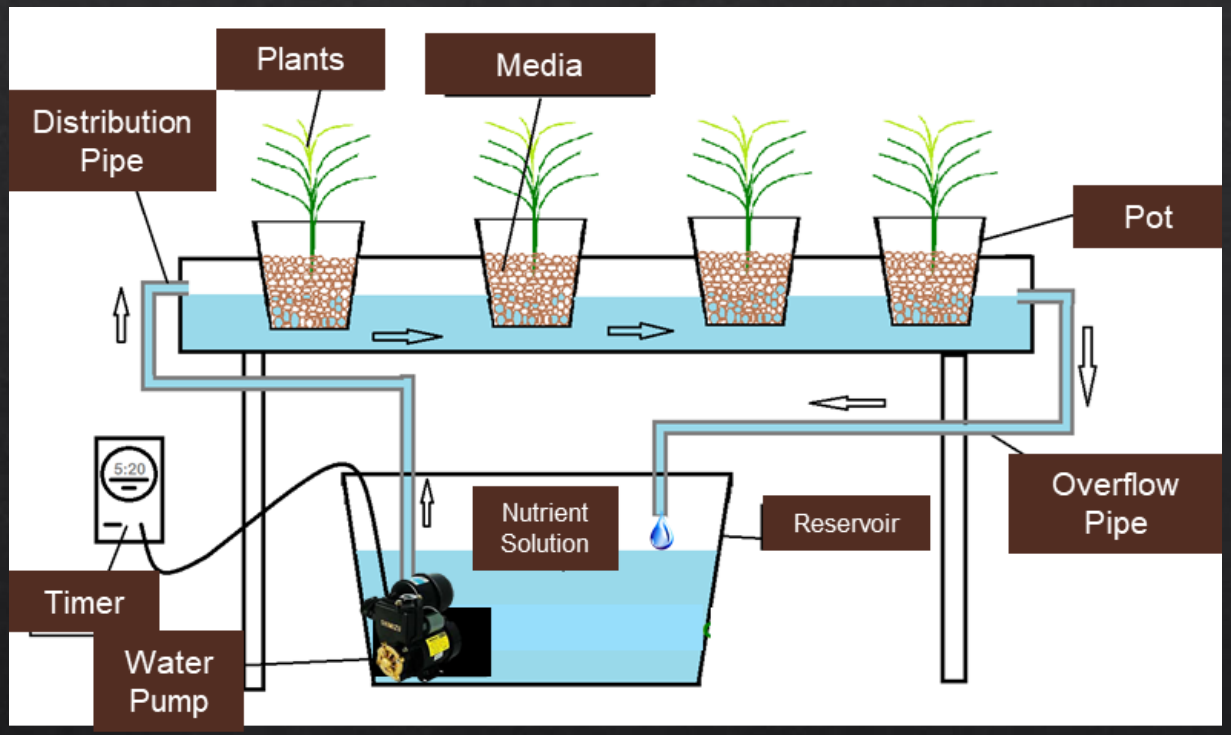
- Installation design for more than one plant, used for leaf vegetables, such as lettuce, kale, and celery.
- This installation design for more than one plant uses a wider container.
- For leafy vegetables, the wick is used for early plant growth.
- After the roots are elongated, the plant can absorb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



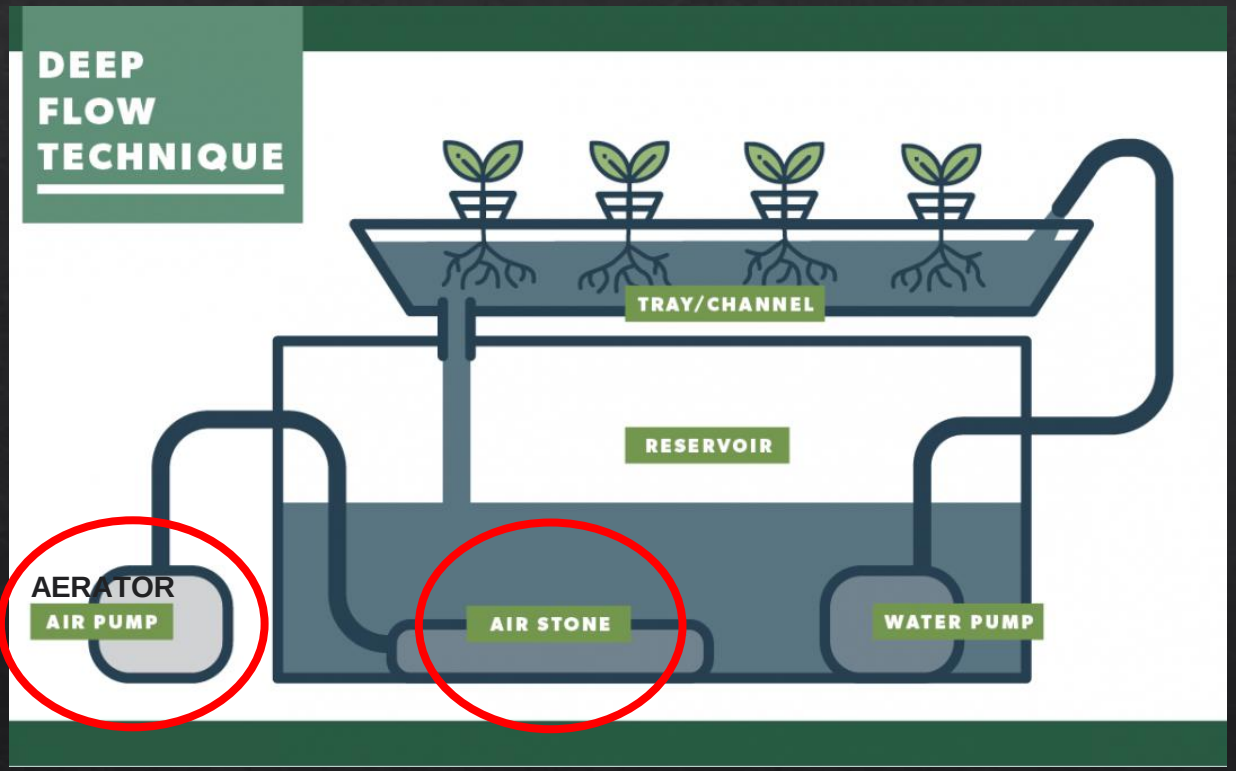
- These wick system installation materials can use the simplest and cheapest materials to the most expensive materials.
- You can use simple ingredients like mineral water bottles.
- You can make an wick system installation like the picture below.

- 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.

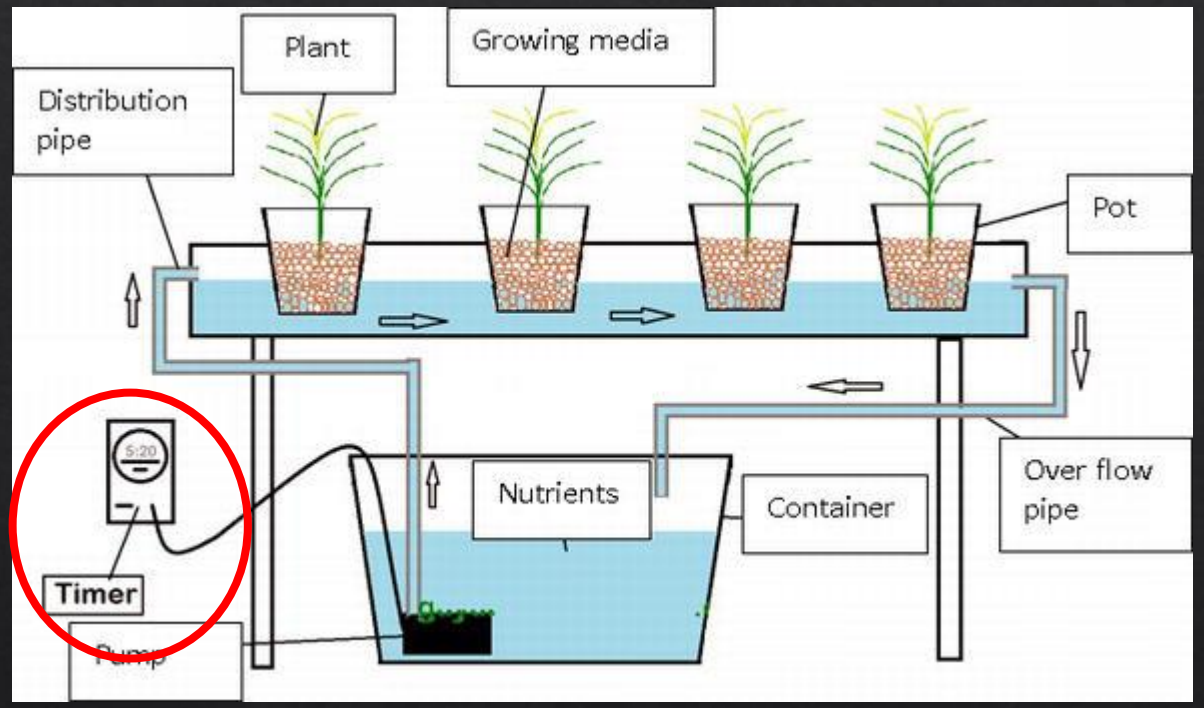
Deep Flow Technique (DFT) System



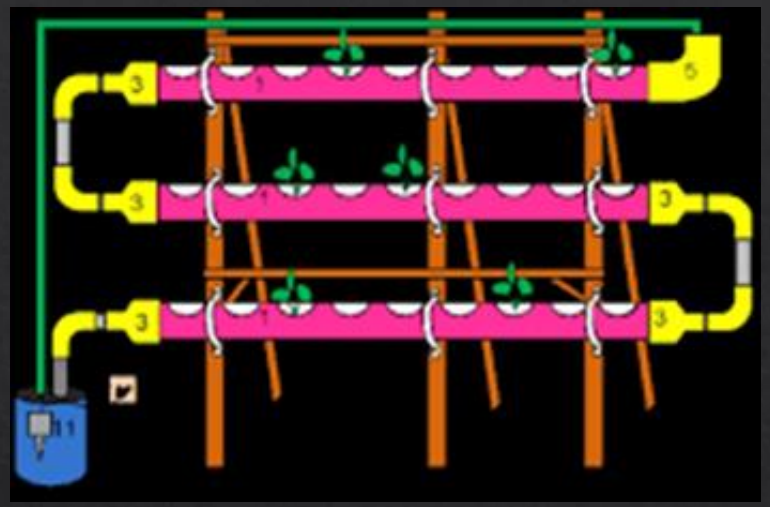
- The DFT system works by circulating the nutrient solution to the root area of the plant.
- The nutrient solution is flowed from the reservoir through the root area and back to the reservoir.
- In the root area, the nutrient solution pools and partially soaks the plant roots. The nutrient solution is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

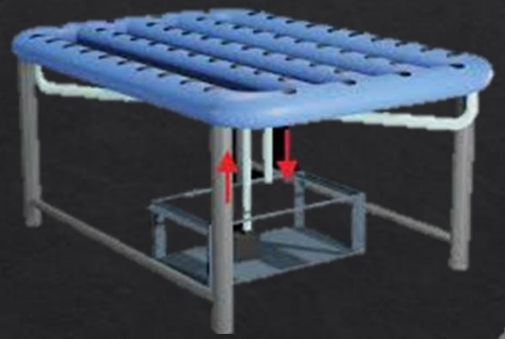


- In some cases, this DFT system uses an aerator to produce sufficient air in the nutrient solution.
- The availability of sufficient air around the roots will make it easier for the roots to absorb nutrients optimally.

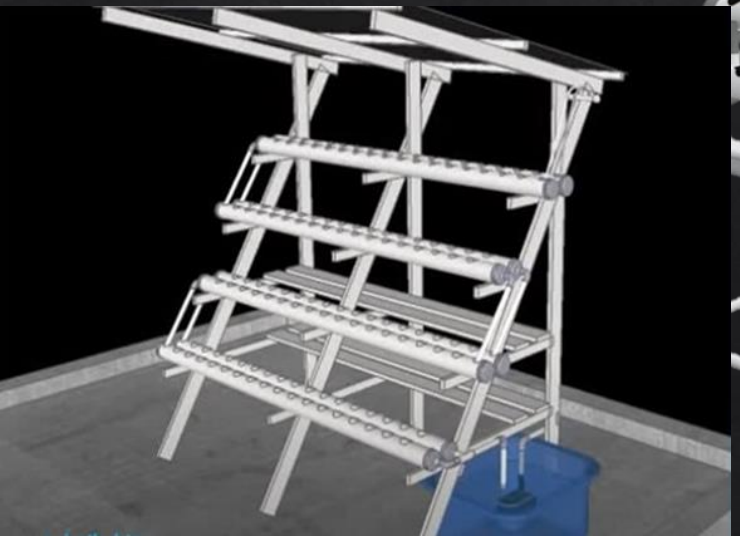


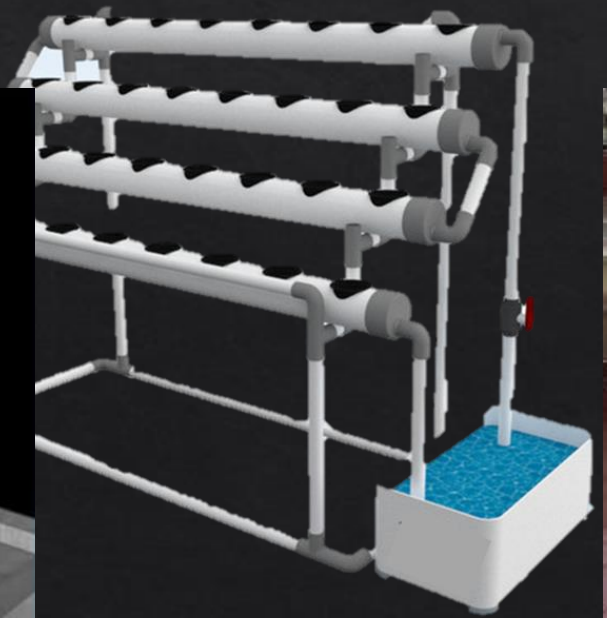
- Sometimes a timer is also needed to provide a nutrient solution at regular intervals.
- The timer can save electricity and nutrient solution, because the pump works to circulate the nutrient solution when needed.
- For example, leafy vegetables do not need nutrients throughout the day (24 hours). The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

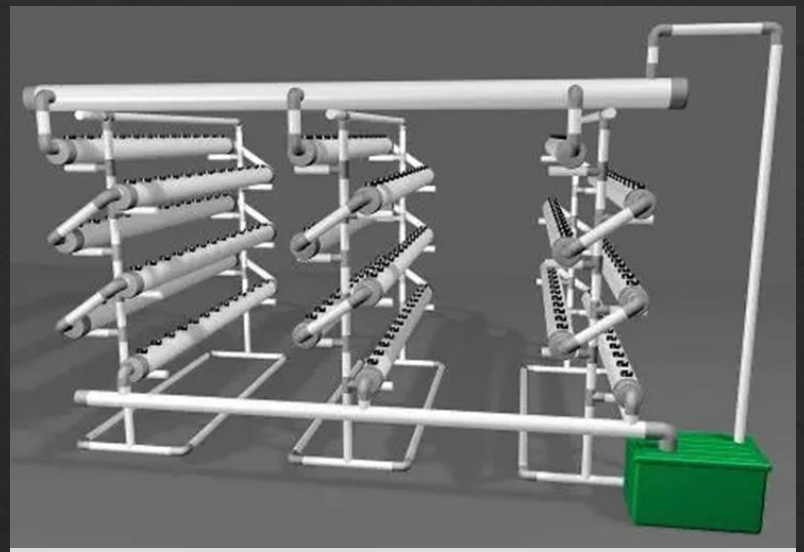


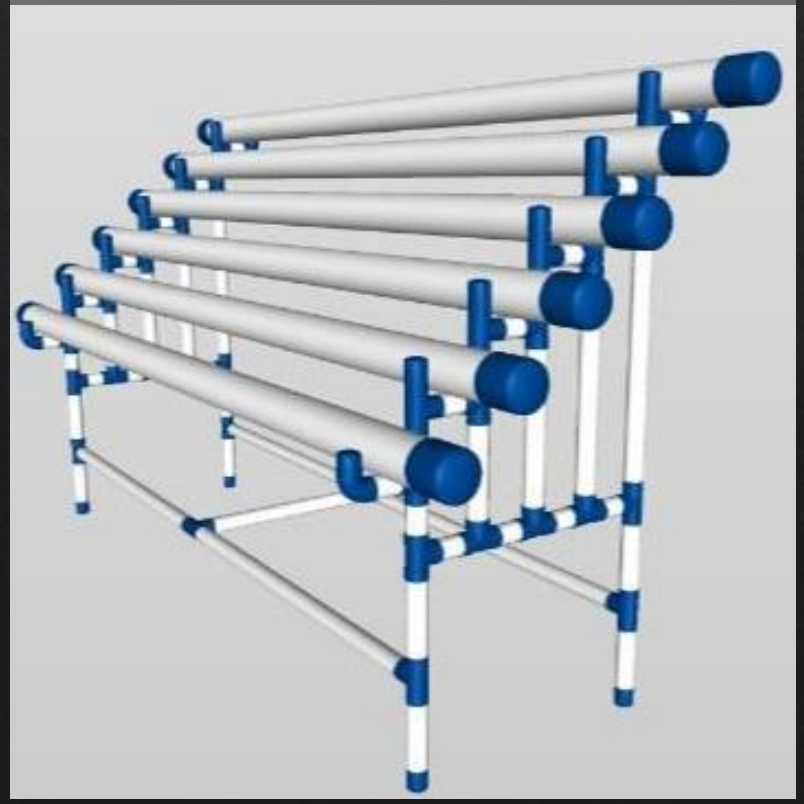


- The DFT system makes it possible to design various installation models.
- You will design any kind of DFT system installation design, make sure that the nutrient solution circulation channel is running properly.

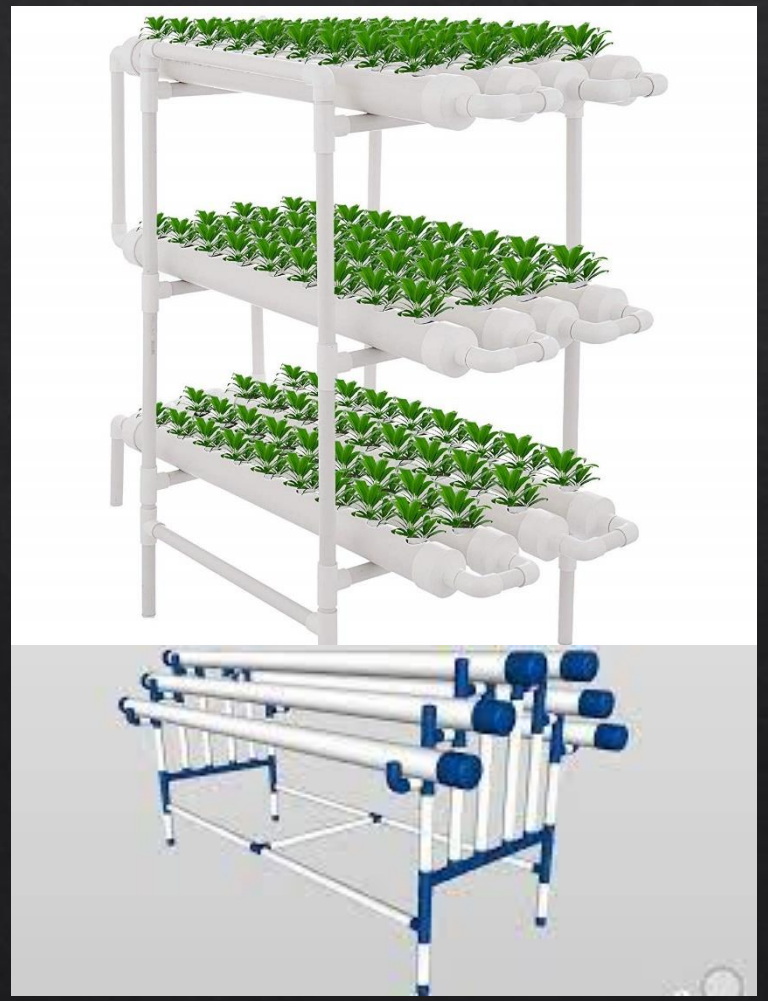


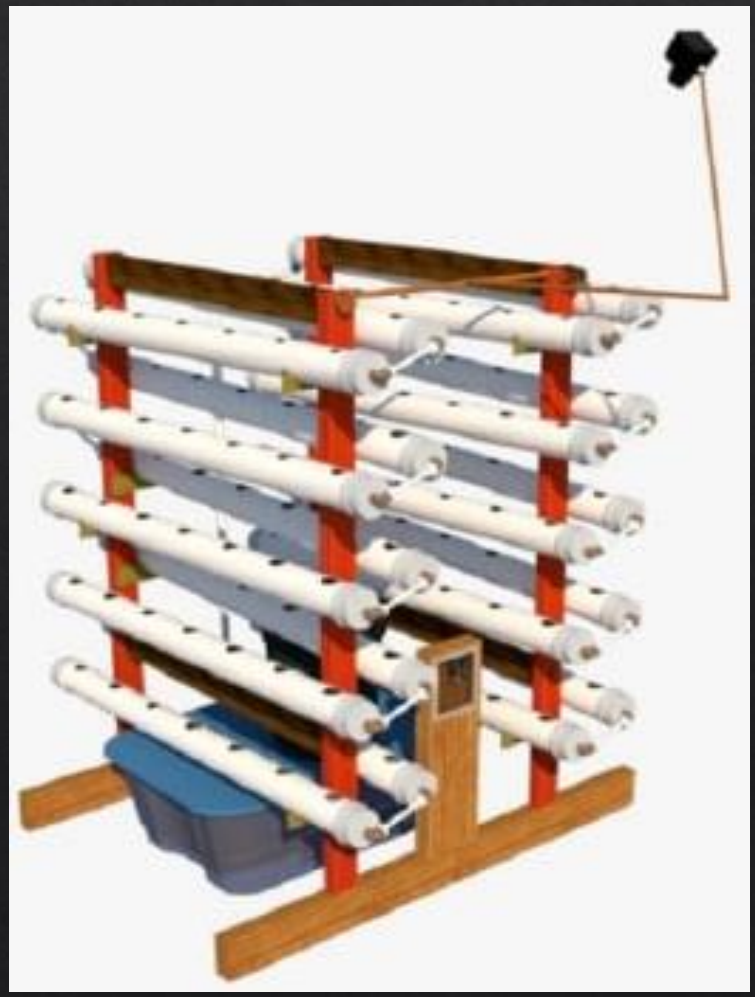


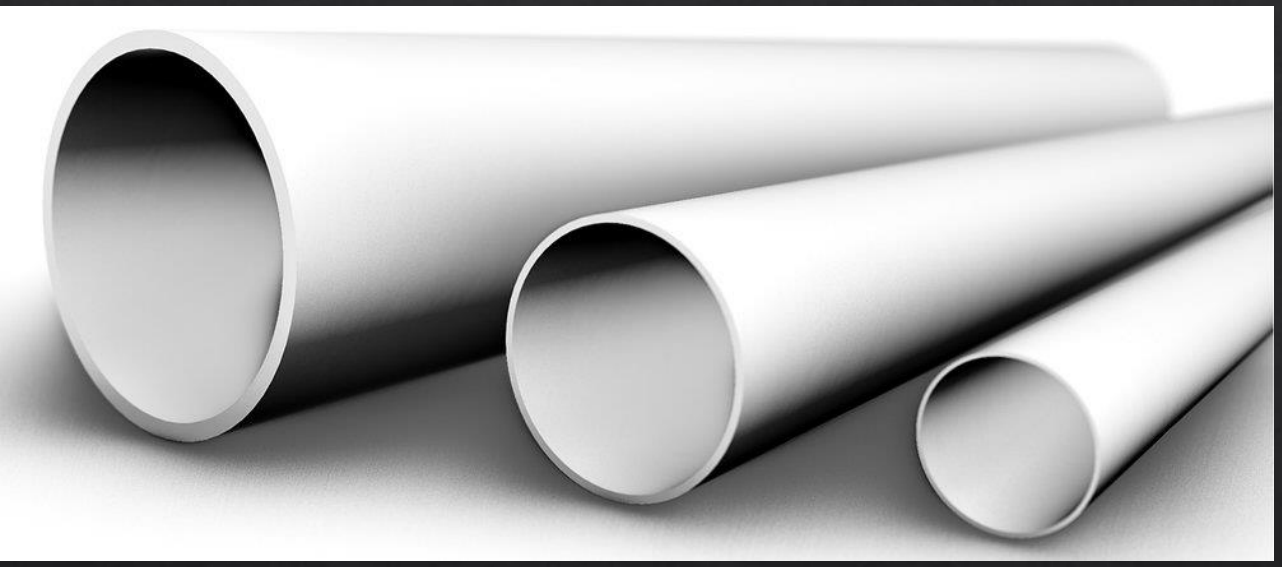




- The following designs can be your inspiration to create a more unique and attractive DFT system installation model.





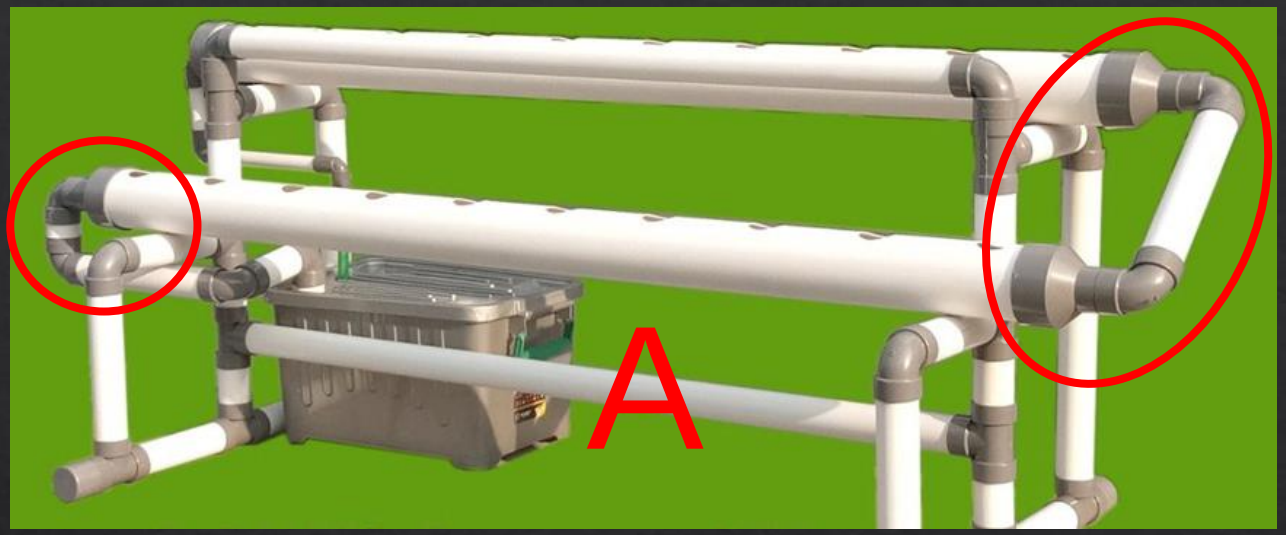


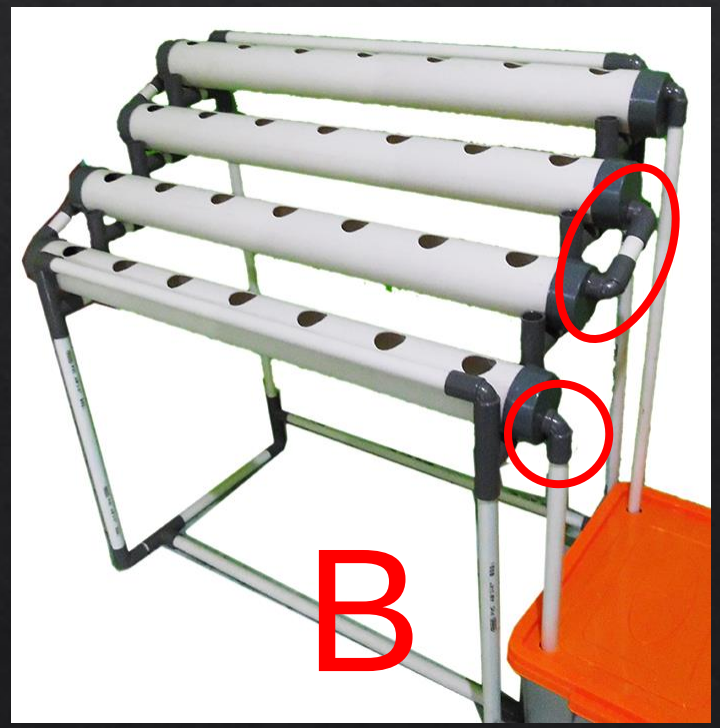
- In general, the material used to make the installation of a DFT system is paralon pipe.
- Be careful with paralon pipes that contain lead, because it will affect the nutrient solution.
- Use light colored paralon pipes, dark colored pipes will absorb heat, and heat will affect the nutrient solution.

- 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.

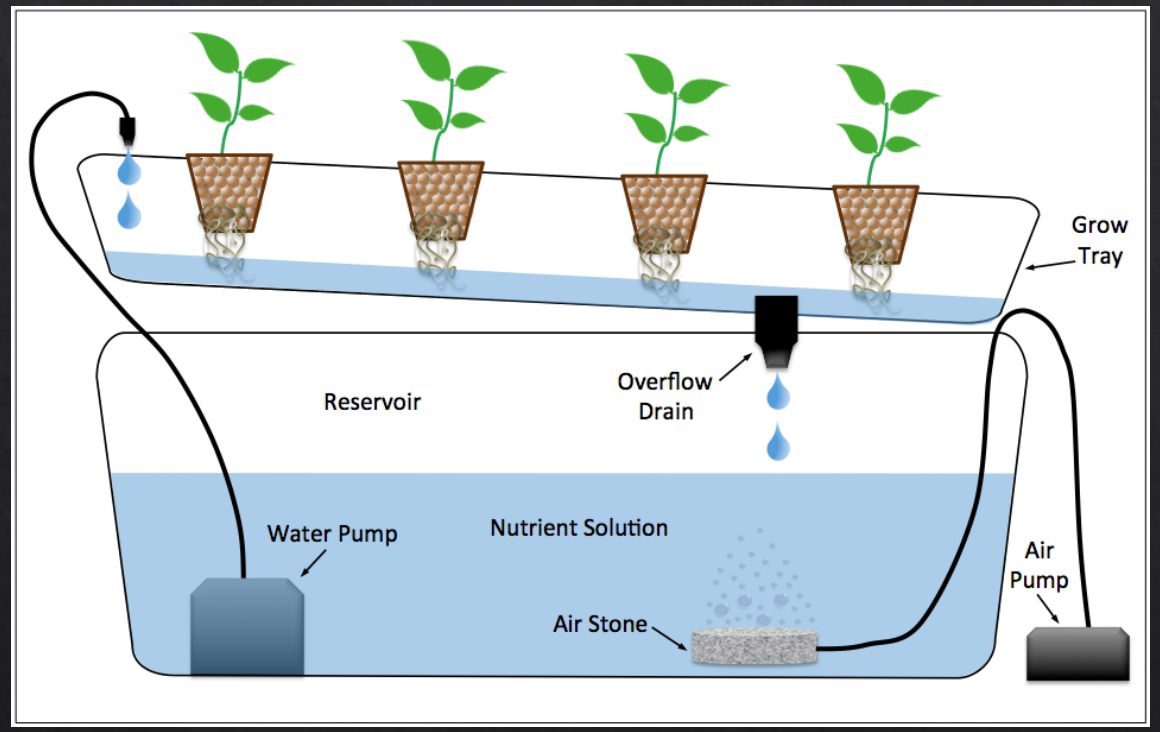
- It is important to note in the selection of connections between paralon pipes.
- Improper pipe connection will cause the circulation of nutrient solution is not smooth.



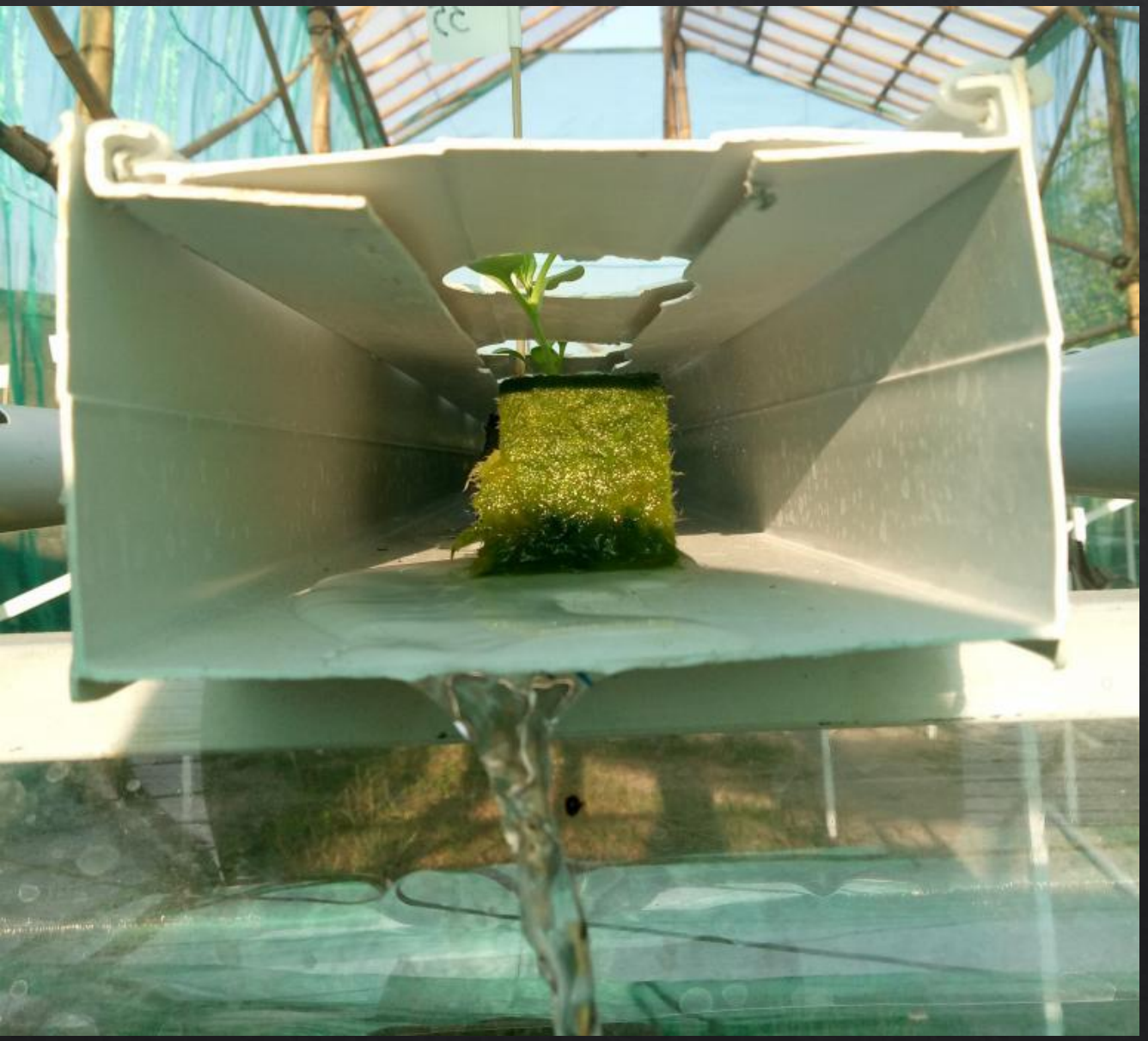


- The two examples of images below are 2 different models of connections between paralons.
- Figure A allows for a smoother circulation of the nutrient solution than Figure B.

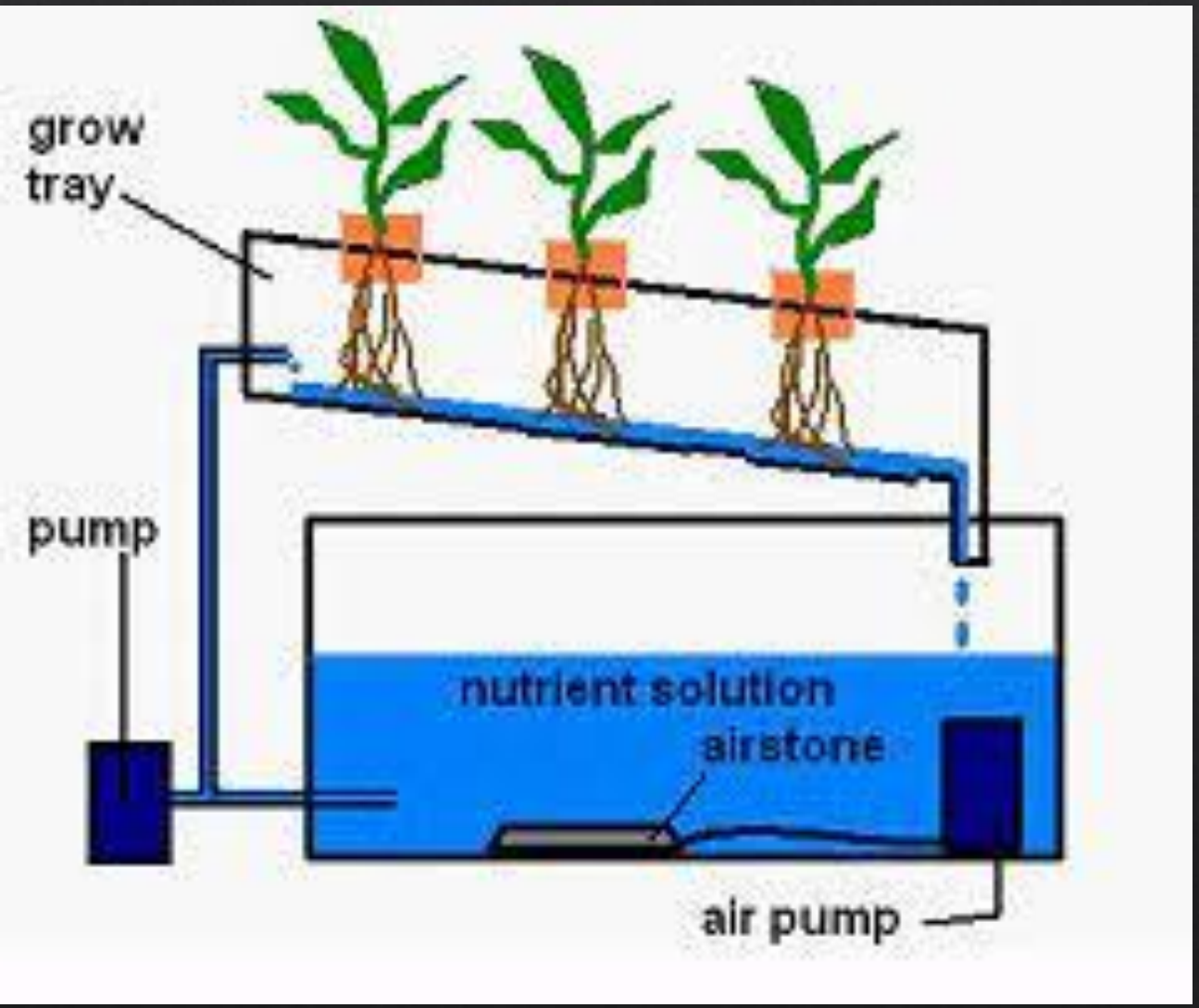
Nutrient Film Technique (NFT) System



- 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.



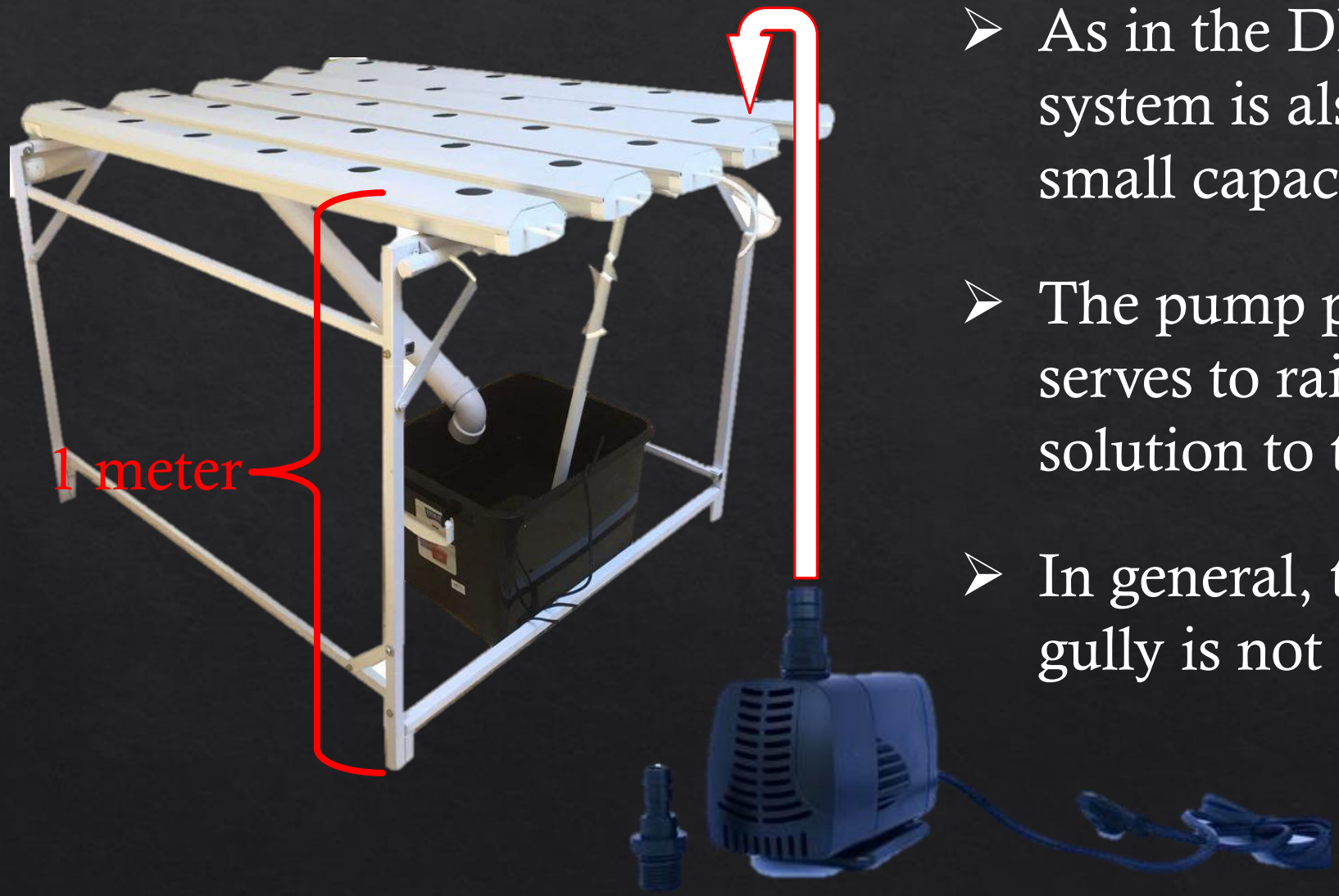
- The surface of the NFT system installation is fed with a very thin nutrient solution, the nutrient solution passes through the plant roots without inundating them.
- At the time of early plant growth, the nutrient solution is absorbed by rockwool and flowed to the plant roots.



- 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.



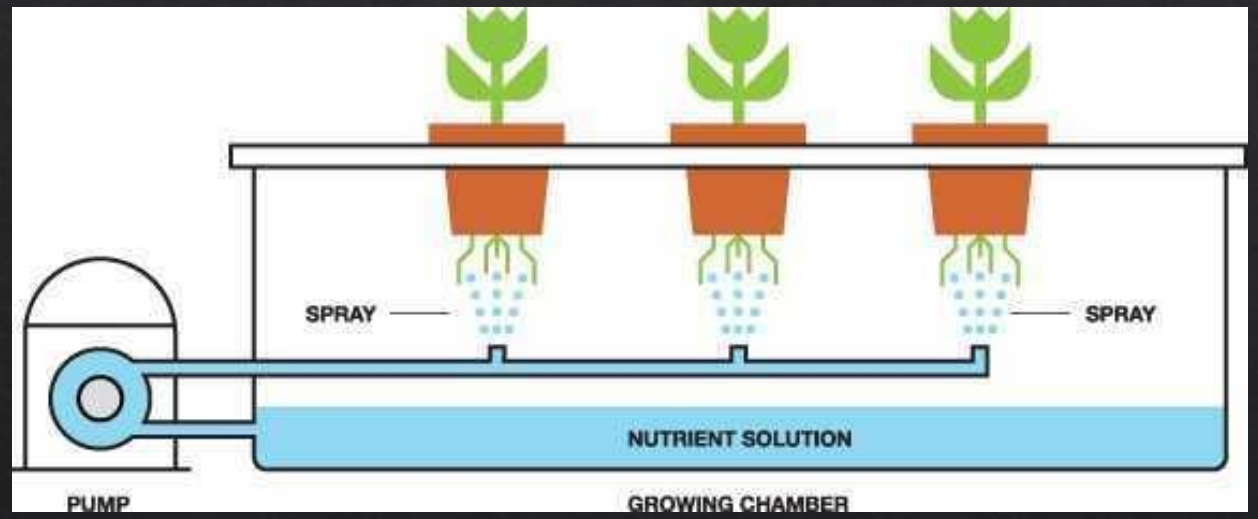
- As in the DFT system, the NFT system is also sufficient to use a small capacity pump.
- The pump power needed only serves to raise the nutrient solution to the gully.
- In general, the height of the gully is not more than 1 meter.

- 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.

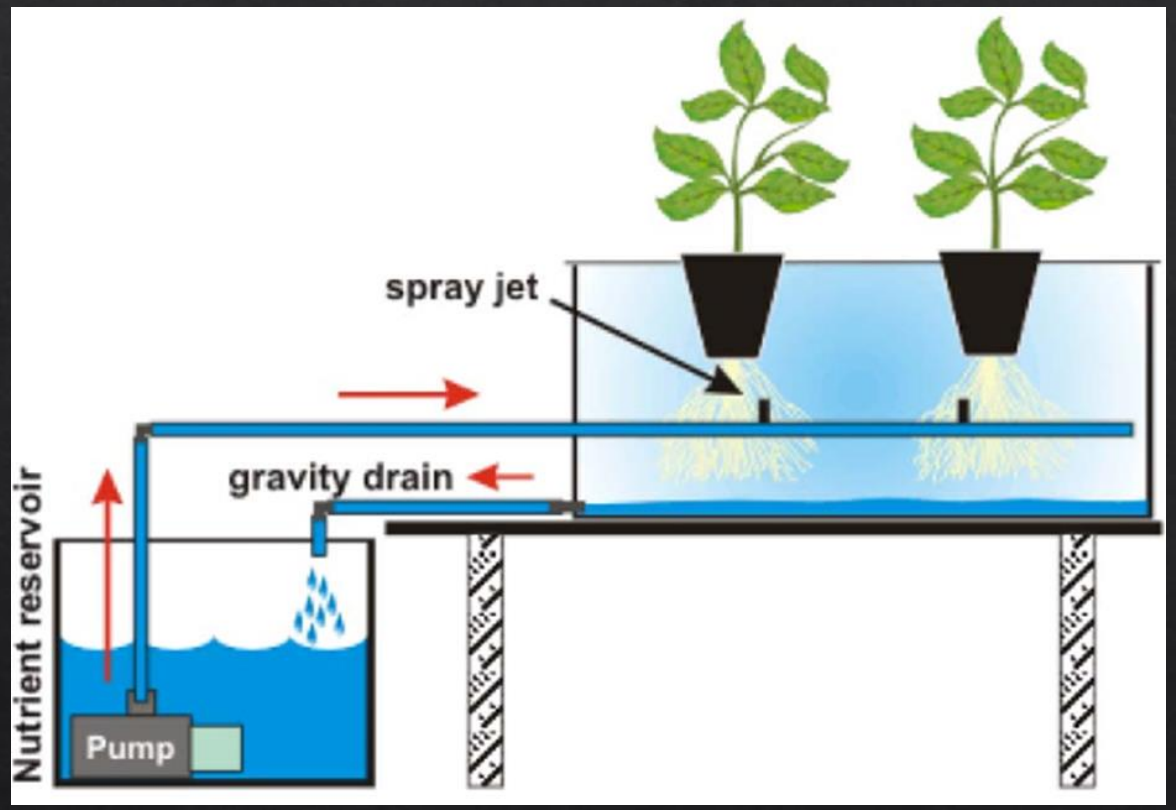
- It is important to pay attention to the design of the distribution channel for the nutrient solution.
- Please pay attention to the picture. The design A nutrient solution distribution channel is easier to clean than design B.

4

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.

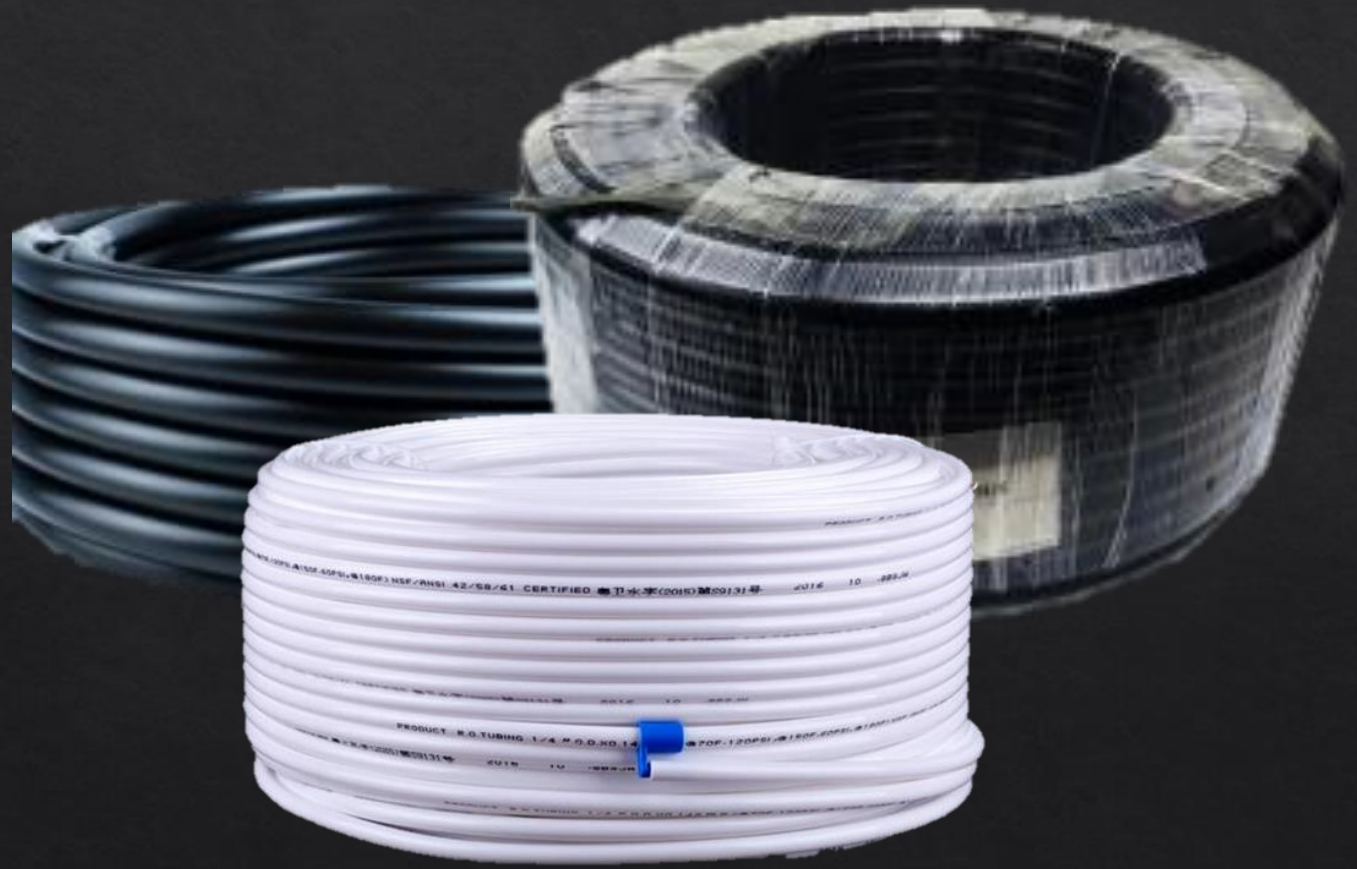
- The following are some of the components needed in the manufacture of an aeroponics installation:

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:

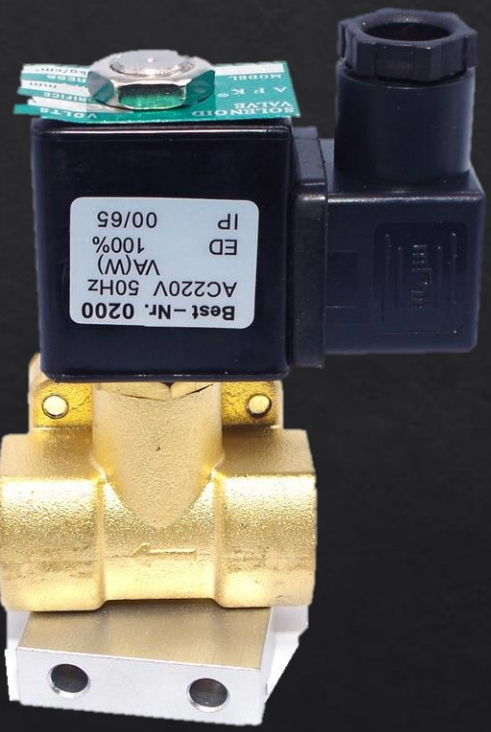


6) RO Hose: deliver nutrient solution from the pump to the plants.

- 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.

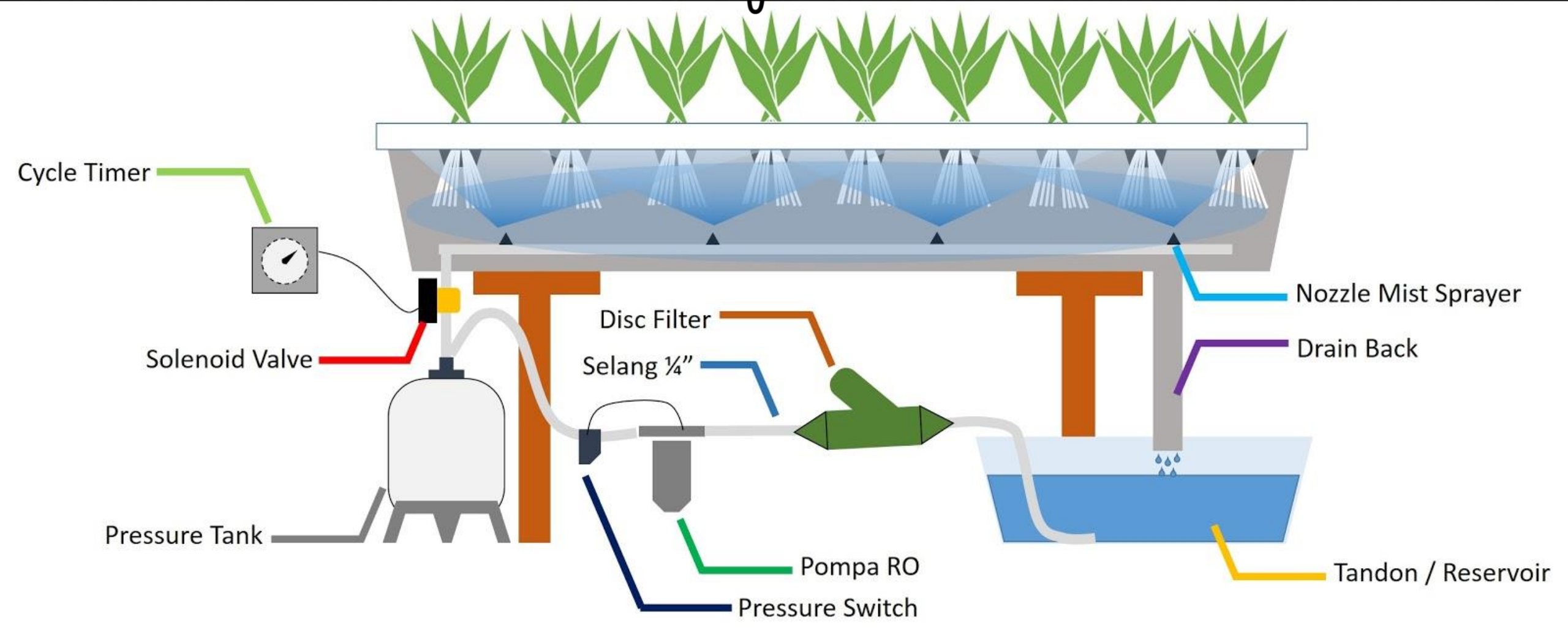
- The following are some of the components needed in the manufacture of an aeroponics installation:

9) Reservoir: a place to hold nutrient solution.

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

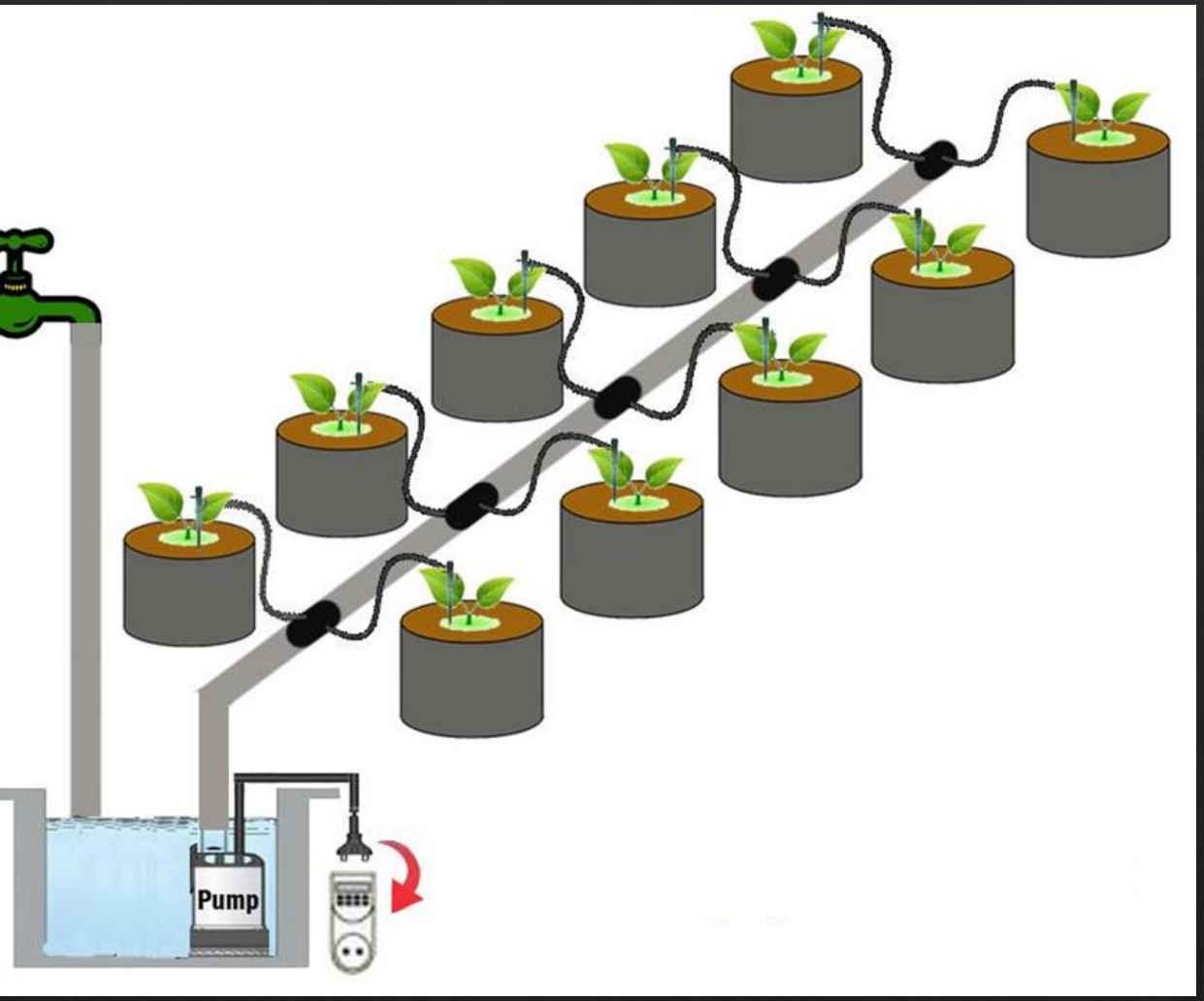
9) Hose Adapter (connector): hose connector with filter disc.

The following is a complete aeroponics installation



5

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

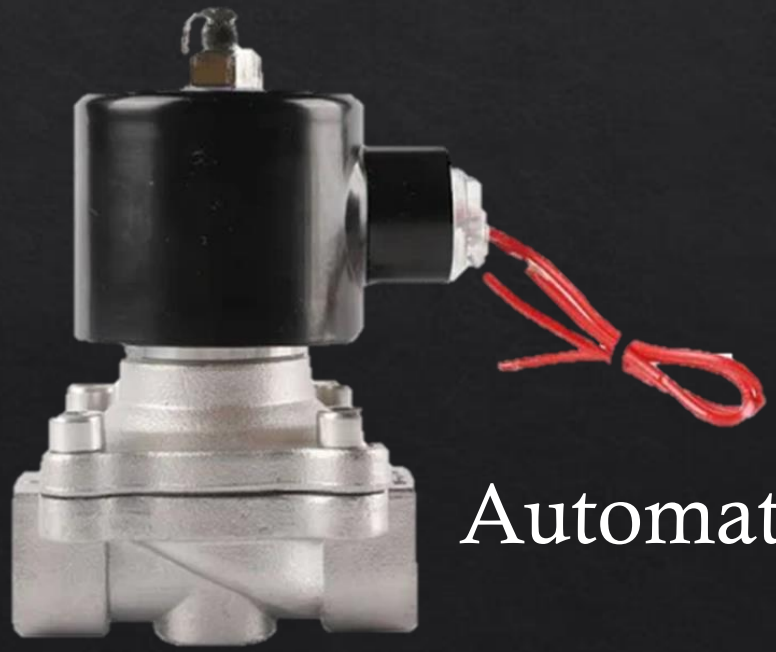
6) Ventury:
produce air bubbles (oxygen)
in the solution.

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

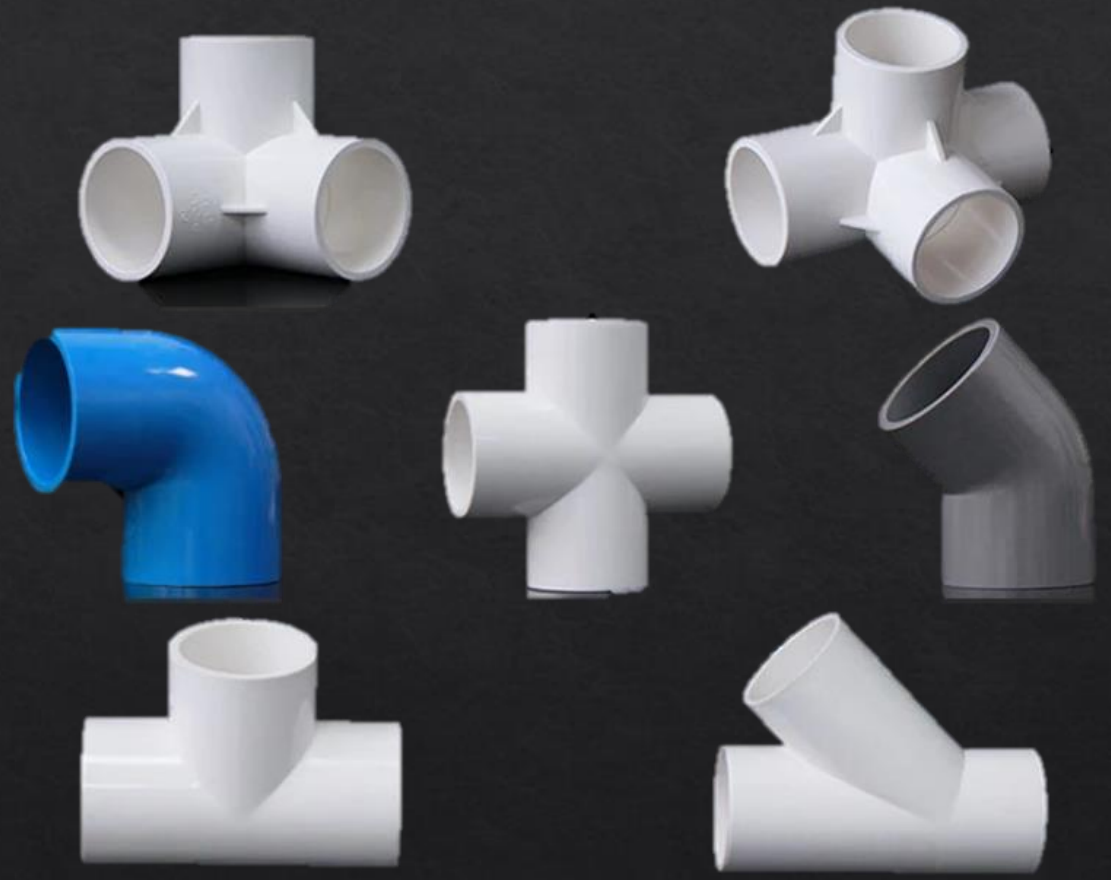
11) Air Vent Valve:
entering and removing air in the water line, and adjusting the flow or volume of water.

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

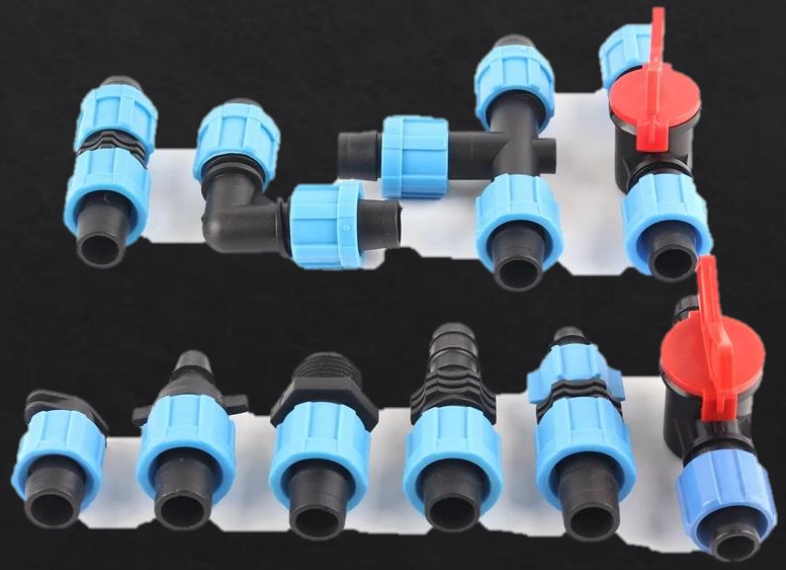
14) Flush Valve:
cleaning and disposing of
dirt in irrigation canals.

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

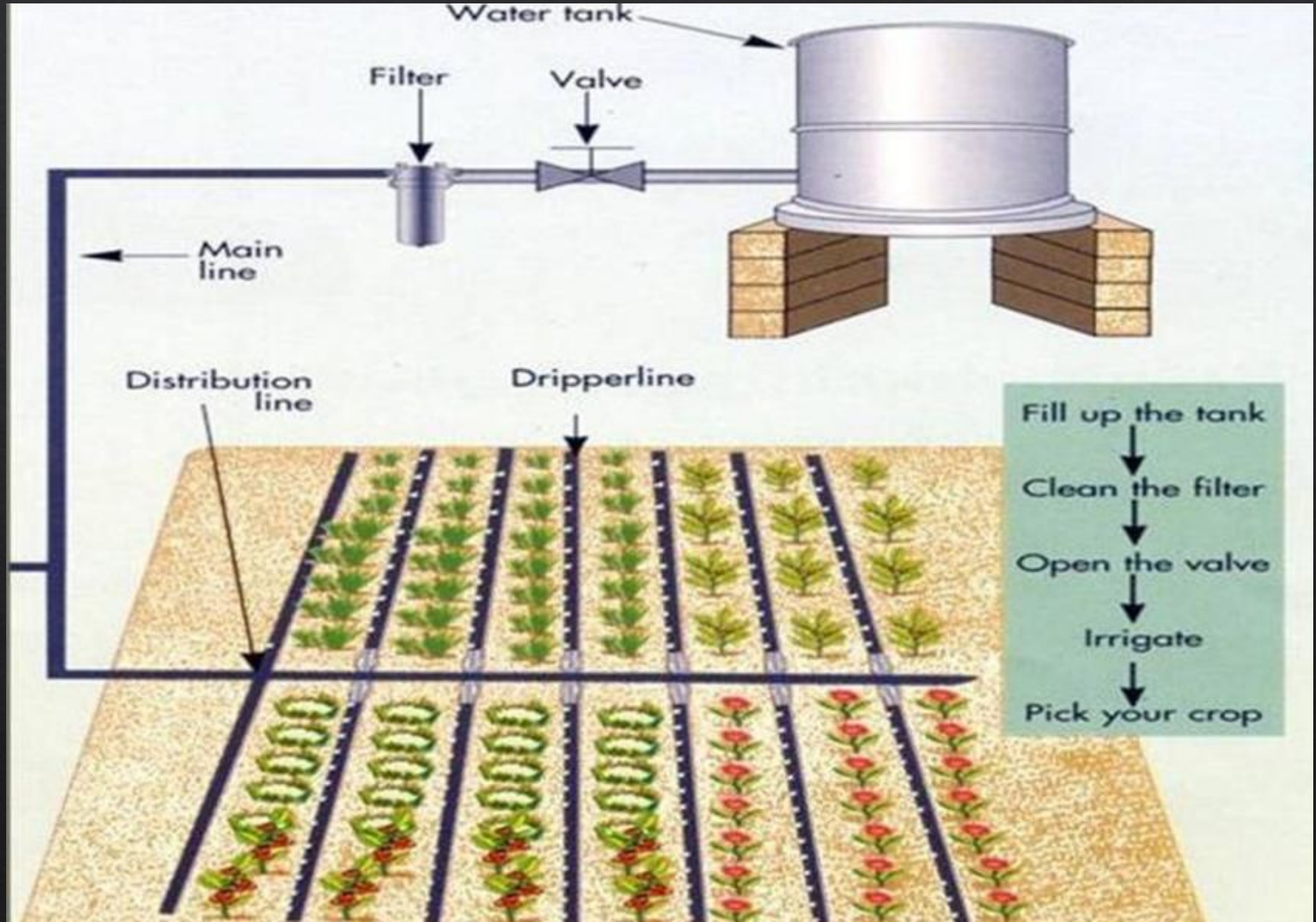
PE Hose

RO Hose

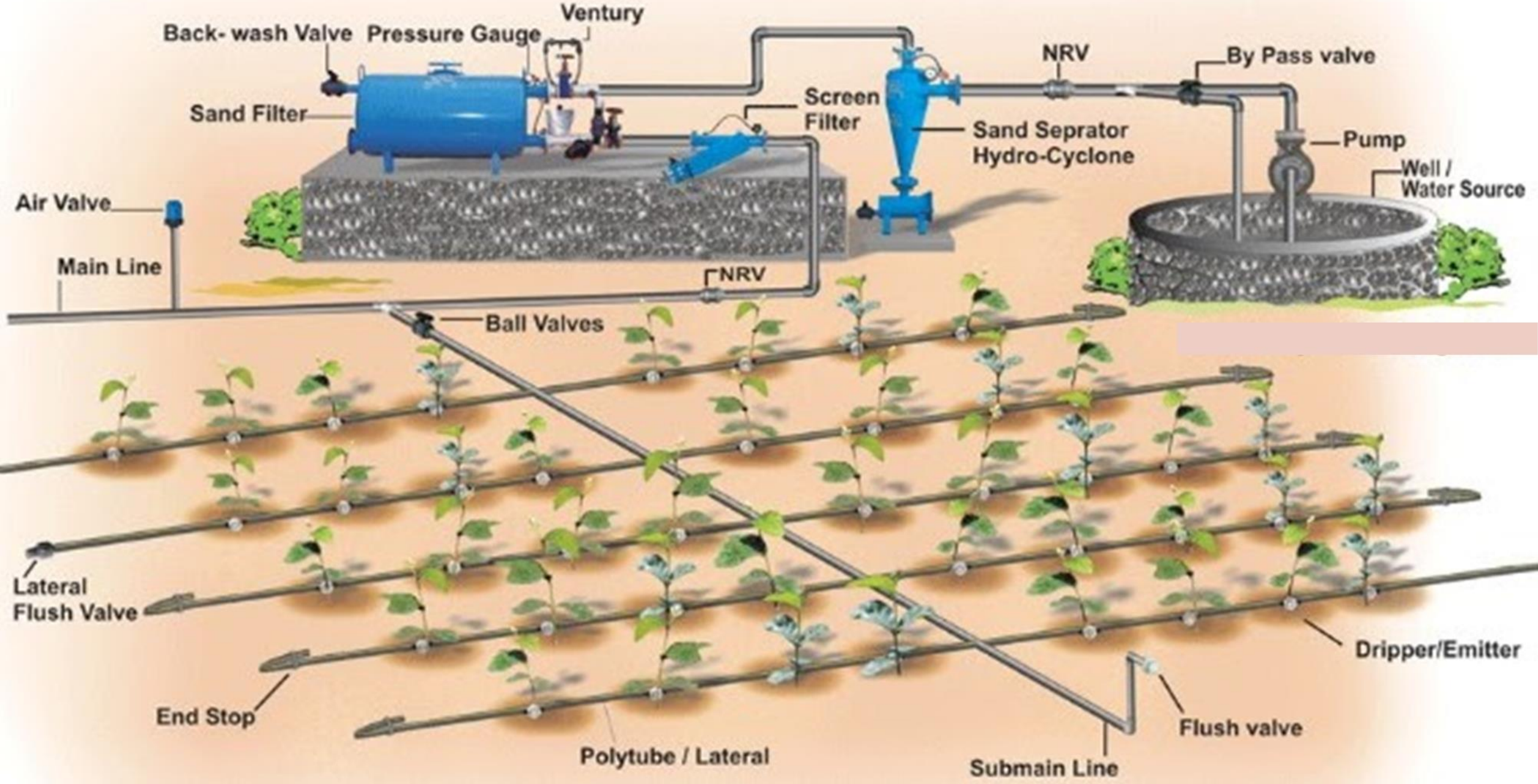
Components of Drip Irrigation System Installation

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